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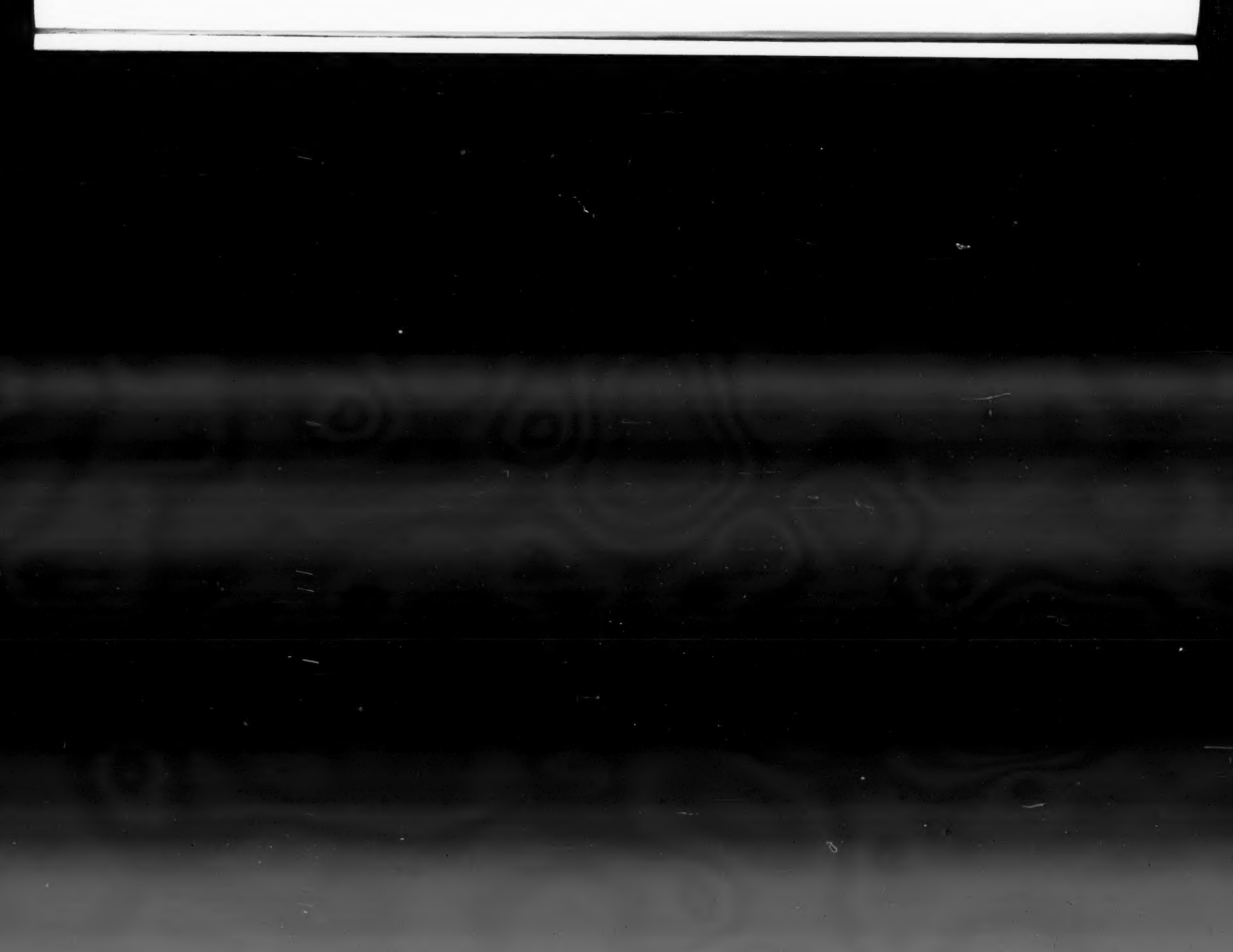

SURGERY, GYNECOLOGY AND OBSTETRICS

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TREATMENT OF DIFFUSE DILATATION OF ŒSOPHAGUS BY OPERATION

DESCRIPTION OF A HITHERTO UNPUBLISHED METHOD. REPORT OF A CASE

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THE treatment of diffuse dilatation of the œsophagus has been directed toward the alleviation and removal of the supposed causative factor, which is now generally assumed to be a reflex spasm of the lower end of the œsophagus, or cardiac opening of the stomach, and commonly spoken of as cardiospasm.

This spasm was suggested as the etiological factor first by v. Mikulicz (1) in 1882, and was confirmed by Leichtenstern (2) in 1891 at the autopsy of a patient who had died but two hours previously. That it is not the sole etiological factor seems to be proven by the fact, as suggested by Rosenheim (3), that similar dilatations are only rarely met with as accompaniments of organic strictures, and he suggests as an additional element an inherent predisposition, such as a weakness of the œsophageal musculature.

In attempts to relieve this condition, dilatation of the cardiac opening has been the favorite mode of procedure, and in the majority of cases has proved efficient in relieving the symptoms. V. Mikulicz (4), in 1904, accomplished this by opening the stomach through a laparotomy wound and dilating the cardia by means of a clamp, the blades of which were protected by rubber tubing, which was passed through the cardia from below upward. Iden (5) recently reported a case in which a cure was effected by the same procedure. Later, v. Mikulicz (6) passed his fingers through the cardia and dilated with them in place of the clamp, as did Erdmann (7), following his example.

Several instruments have been devised by which dilatation may be accomplished without an open operation. Russell (8), in England, first reported success in these cases by this mode of treatment. The best known apparatus, however, are those devised and described by Gottstein (9) in Germany, and by Plummer (10) in America. The essential feature consists in a soft rubber dilatable bag or balloon, covered by silken mesh or material and fastened on to a bougie. This is passed from above downward through the cardia, and then, by distending the bag with water under regulated pressure, the cardia can be subjected to a dilating force of any degree desired.

This procedure takes into account and relieves but one element; namely, the spasm at the cardia. Recently a certain small proportion of failures and recurrences after this treatment have been reported. Since the œsophagus, which has become greatly dilated, in many cases does not regain its muscular tone and cannot return to its normal size and shape, it is not strange that the simple dilatation of the cardia fails to accomplish a permanent cure.

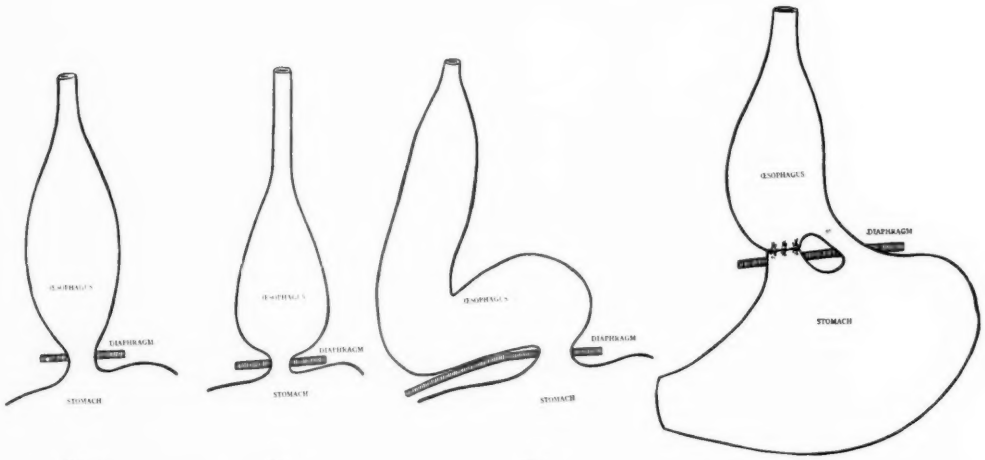

Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Fig. 1. Fusiform dilatation of the œsophagus.
Fig. 2. Pear-shaped dilatation of the œsophagus.
Fig. 3. "ᔕ"-shaped dilatation of the œsophagus.

Fig. 4. Œsophago-gastrostomy. Portion of stomach drawn through an opening in the diaphragm, and the line of union between stomach and dilated œsophagus lies above the diaphragm, and within the thoracic cavity.

In a certain number of cases a very important element in the condition, namely, the form and character of the ectasia, must be considered, and the treatment must be directed to the relief of an anatomical arrangement which forms a mechanical hindrance to a cure by means of simple dilatation of the cardia.

Dilatation of the œsophagus may be fusiform, pear-shaped or "ᔕ"-shaped.

In the fusiform variety, which is most frequently met with, the cardia is the most dependent portion and there is no increase in the length of the œsophagus. The lumen of the œsophagus is increased from above downward to a point approximately midway between its upper end opposite the cricoid cartilage, and its lower end the cardia, and it then gradually diminishes in diameter until it passes through the diaphragm or enters the stomach (Fig. 1).

In the pear-shaped variety, the lumen attains its greatest degree of dilatation just prior to its passage through the diaphragm, and in this case also the cardia is the lowest and most dependent portion of the œsophagus (Fig. 2).

Both of these forms are relieved by simple dilatation of the cardia, although the walls of the œsophagus never return to normal, but remain hypertrophied, and the lumen never regains its normal caliber. The patients, however, continue free from symptoms for many years, as the œsophagus drains readily into the stomach through the dilated cardia and no stagnation of food or fluids results. Recently Plummer (11) states that the œsophagus does regain its shape and size and that its walls can, and often do, return to normal. This is contrary to the experience of most observers and writers.

The "ᔕ"-shaped variety is the rarest form and arises in the following manner: The upper end of the œsophagus opposite the cricoid cartilage, and its lower end at the cardia, being more or less firmly fixed points, the canal bends in those cases in which, as the dilatation of the œsophagus advances, there occurs also an increase in its length. This usually results in a curve toward the right; and the dilated œsophagus rests on the diaphragm to the right and posterior to the cardia, and from here it passes upward, forward and to the left, and enters the abdomen through the diaphragm at a higher level. There is thus developed a reservoir or

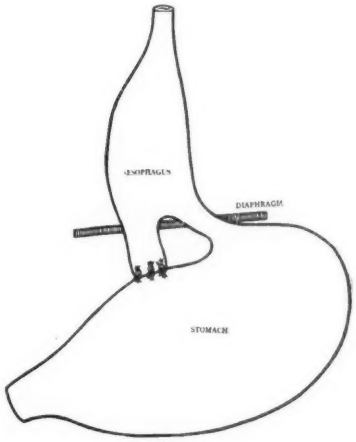

Fig. 5.

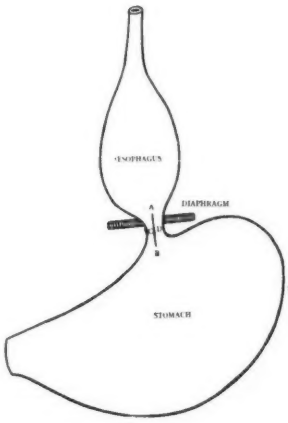

Fig. 6.

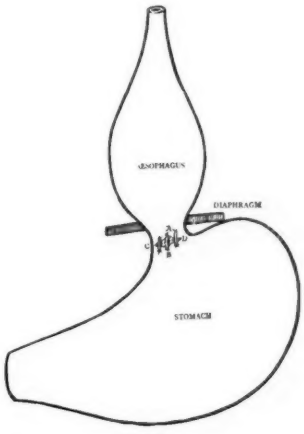

Fig. 7.

Fig. 5. Œsophago-gastrostomy. Portion of dilated œsophagus drawn through an opening in the diaphragm, and line of union between stomach and dilated œsophagus lies below the diaphragm, and within the peritoneal cavity.

Fig. 6. Cardioplasty showing line of incision A-B, which divides the constricted or spastically contracted cardia, in a line parallel to the long axis of the œsophagus.

Fig. 7. Cardioplasty showing the vertical incision united so that it lies transversely, in line C-D, to the long axis of the œsophagus. Note increase in lumen of cardia.

dead space, which is placed below the level of the cardia (Fig. 3). The stretching of the cardia will fail to remedy the mechanical difficulty which has developed in addition to, although as a result of, the cardiospasm. In fact, in some cases, the cardiospasm may have long since become inoperative.

With the purpose of removing the redundancy, Willy Meyer (12) in 1911 devised, and successfully performed, œsophagoplication. This is carried out by the transpleural route. The fibers of the vagus are stripped from the œsophagus, and by infolding the wall of the œsophagus the lumen is diminished. The procedure, however, would not in itself relieve the cardiospasm, although Meyer states that in his case the spasm was relieved and suggests that this resulted from the stripping of the fibers of the vagus from the œsophagus.

Œsophago-gastrostomy has been proposed and elaborate descriptions, based on work done on animals and the cadaver, have been written by Levy (13), Biondi (14), Janeway and Green (15), and Gosset (16).

This consists in establishing a communication between the dilated œsophagus and the stomach. This procedure was a brilliant conception, for although it would not relieve the spasm, still it would render it inoperative by diverting the food above the point of obstruction, and, at the same time, it would drain the dead space formed by the lengthened and dilated œsophagus. The line of union between the œsophagus and the stomach may be above or below the diaphragm, depending on whether one follows the transpleural or the transperitoneal route. In the former case a portion of the stomach is drawn up through an opening in the diaphragm and united to the œsophagus (Fig. 4). This procedure may be indicated in certain cases of cicatricial stricture in which the œsophagus is not dilated, or in cases of malignant disease in which a portion of the œsophagus must be removed; but is scarcely indicated in the "ᔓ"-shaped form of diffuse dilatation, because a safer and equally efficient method is open to the surgeon. The same communication between the stomach and dilated œsophagus can be established from within the abdomen by drawing the œsophagus through an opening in the diaphragm (Fig. 5). This is a safer procedure because the line of anastomosis lies within the peritoneal cavity and in case of any leakage the infection is taken

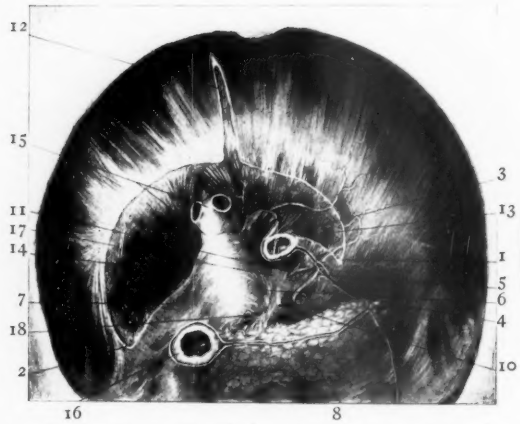

Fig. 8. Showing the relation of œsophagus to surrounding structures on under surface of diaphragm and posterior abdominal wall: 1, cut edge of left lateral ligament of liver on diaphragm; 2, cut edge of right lateral ligament of liver on diaphragm; 3, œsophagus divided; 4, splenic vessels divided and emerging from beneath tail of pancreas; 5, gastro-epiploica sinistra artery divided, lying in gastro-splenic omentum; 6, peritoneum of lesser sac covering structures on posterior abdominal wall; 7, posterior wall of foramen of Winslow; 8, pancreas covered by peritoneum of greater sac; 9, attachment on pancreas of transverse mesocolon; 10, gastric artery divided; 11, phrenic branch of aorta; 12, reflection of peritoneum divided, forming falciform ligament of liver; 13, non-peritoneal surface of diaphragm, formerly in contact with left lobe of liver; 14, non-peritoneal surface of diaphragm, formerly in contact with right lobe of liver; 15, inferior vena cava, with divided hepatic veins; 16, duodenum divided; 17, aorta; 18, hepatic artery divided.

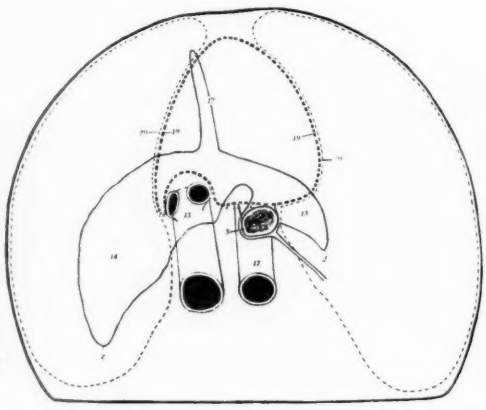

Fig. 9. Showing the relation to one another of the structures below and above the diaphragm: 1, cut edge of left lateral ligament of liver; 2, cut edge of right lateral ligament of liver; 3, œsophagus; 12, falciform ligament of liver; 13, non-peritoneal surface of diaphragm, formerly in relation to left lobe of liver; 14, non-peritoneal surface of diaphragm, formerly in relation to right lobe of liver; 15, vena cava inferior; 17, aorta; 19, line of reflection of pericardium; 20, line of reflection of right and left pleuræ; E–F, the area in diaphragm and the direction forward and to the right, where an incision may safely be made, in order to enlarge the opening in diaphragm through which œsophagus enters the abdomen.

care of better by the peritoneum than by the pleuræ or tissue of mediastinum.

Cardioplasty, which is analogous to pyloroplasty of Heinecke and v. Mikulicz, was suggested by Marwedel (17) and has been performed by Wendell (18). The operation consists in dividing the cardia by a vertical incision running parallel to the long axis of the œsophagus (Fig. 6), and then in uniting this incision in such a manner that the line of union lies transverse to the long axis of the œsophagus (Fig. 7). This procedure would accomplish nothing which could not be more safely brought about by a simple dilatation, as the operation would simply relieve the spasm, and would not drain the dependent portion in the "ᔕ"-shaped variety of dilation. The procedure described below will accomplish both of these objects.

As the region in which the operative procedure is carried on lies on the posterior abdominal wall, covered by the left lobe of the liver and protected from external violence by the overhanging lower limits of the thoracic cavity, formed by the lower ribs and the portion of the diaphragm attached thereto, and in consequence rendered just so much more inaccessible to operative interference, the question of the abdominal incision becomes an important one.

The abdominal incision which was employed was first made use of by v. Mikulicz (4) and has the advantage of not dividing the various nerves which supply the muscles of the abdominal wall, notably the upper portion of the rectus abdominis.

The incision commences at the ensiform cartilage and passes down to the umbilicus and then at a right angle to the tip of the tenth rib. In addition to this there is a second incision which is below the left breast over the eighth rib, and through this the seventh, eighth and ninth ribs are divided, without, however, injuring or opening the pleura.

Fig. 10. X-ray antero-posterior view, before operation; showing the bend or "ɔ"-shaped curve of the lower portion of the dilated œsophagus. Note that there is no evidence that any of the bismuth meal has entered the stomach.

Although the fracture of the ribs seems like rather a formidable procedure, still it is warranted as it adds nothing to the danger of the operation, and allows of a much wider and more extended exposure by permitting the bending back of the abdominal flap and thus flattening out the diaphragm.

The incision proposed by Marwedel (20) and employed by most European writers, running parallel to the free border of the ribs, must divide the nerves from the sixth to the ninth and so interfere very materially with the innervation of the abdominal muscles and give rise to a resultant paralysis. It would also give a much more restricted exposure.

The relation of the œsophagus to surrounding structures is shown in Fig. 8, where it is seen that it lies anterior to the aorta and behind the left lobe of the liver, where the latter is attached to the diaphragm by the left lateral ligament. The peritoneum of the lesser sac is reflected on to the œsophagus posteriorly from the aorta, and on the right side from the diaphragm; on the left side the peritoneum of the greater sac is reflected in a similar manner from the left crus of the diaphragm where the two leaves of the gastro-splenic omentum meet on the œsophagus. Anteriorly the œsophagus is not in relation to any peritoneal fold.

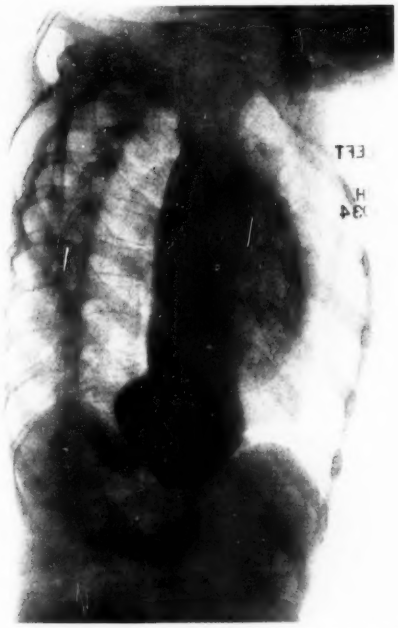

Fig. 11. X-ray, lateral view before operation; showing the reservoir or dead space which lies on a lower level than the dome of the diaphragm where the œsophagus enters the abdomen.

In operations on the œsophagus from within the peritoneal cavity a very important feature of the anatomy of the œsophagus and the structures below the diaphragm is their relation to the structures lying above the diaphragm. These relations are shown in Fig. 9 where it is seen that the pericardium lies directly anterior to the œsophagus, while the left pleura is in close contact on the left side. There is, however, a considerable space on the right side before one encounters the inferior vena cava. It is in this space that one can safely incise the diaphragm. This is indicated in the diagram by the line E-F. Any incision to the left of the œsophagus will surely open the left pleural cavity as was inadvertently done in our case.

The following case, which occurred in the service of Dr. J. A. Blake at the Presbyterian Hospital, and through whose kindness I was

Fig. 12. Showing exposure of lower end of œsophagus after left lateral ligament of the liver has been divided and liver drawn downward and to the right: 1, cut edge of left lateral ligament of liver on diaphragm; 1a, cut edge of left lateral ligament of liver on liver; 3, lower end of œsophagus and cardia; 13, surface of diaphragm not covered by peritoneum; 14, surface of liver not covered by peritoneum; 21, re-entrant angle between liver and diaphragm.

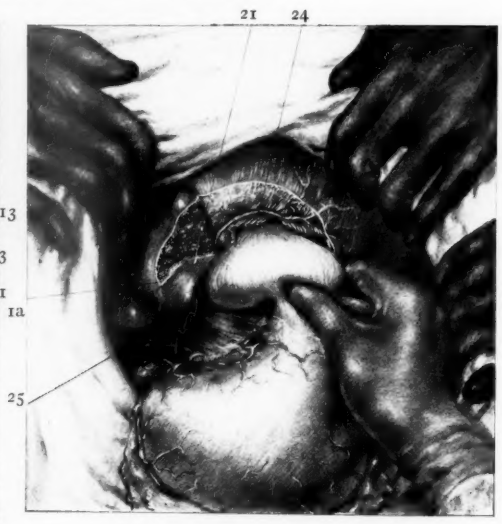

Fig. 13. Showing lower portion of dilated œsophagus (25) drawn down through opening in diaphragm (24); 1a, cut edge of left lateral ligament of liver on liver; 21, re-entrant angle between liver and diaphragm; 24, cut fibers of diaphragm to right of œsophagus; 25, dilated lower end of œsophagus.

able to operate, illustrates many of the foregoing facts, and presents also a new procedure, devised to relieve the spasm of the cardia if present, and to drain the dependent portion of the dilated œsophagus.

Case History: H. S., single, aged 40, Irish, cook; was admitted to Dr. Blake's service at the Presbyterian Hospital, May 6, 1912, with the following history: She was admitted to the medical division on April 10th, and stated that she had had "stomach trouble" for ten years. For the past five years she had had distress after eating and a feeling as though the food stuck in its passage to the stomach but this could be partly washed down with water. She vomited after every meal and this relieved her distress. The vomitus consisted of food she had just eaten. She never had any real pain. She gradually restricted her diet to cereals, eggs and milk, which gave her the least distress and trouble. About one year ago she noticed in the vomitus food taken twenty-four hours previously. She never vomited blood. She had been in the habit of tasting food at irregular intervals and had eaten at irregular intervals because of her occupation as cook.

After a test meal the contents expressed showed the following: Total amount, 190 cc. of thick gray fluid, containing a small amount of mucus; no free HCl; marked reaction for lactic acid, and many bacilli resembling Boas-Oppler bacilli. Her blood showed hæmoglobin 70 per cent; red blood cells, 5,300,000.

She was markedly emaciated; her physical examination at that time reported otherwise negative. A diagnosis of probable carcinoma of the stomach was made and she was transferred to a surgical ward and an exploratory cœliotomy performed. The findings were negative; the stomach was normal; there were a few small fibromyomata in uterus. The appendix was removed. She made a slow postoperative recovery. The wound healed per primum. She was quite unimproved by the operation and was sent back to the medical ward for further observation. May 1st, Dr. T. C. Janeway saw the patient for the first time. He passed a stomach tube and when about half its length had been swallowed a huge reservoir seemed to be tapped and several cubic centimeters of a thin watery fluid containing food particles were obtained. Water was passed through the tube and gurgling sounds were heard over the anterior chest wall, and there developed a dull percussion note. As much fluid as was possible was poured into the sac and then siphoned back. It measured 560 cc. Dr. Janeway thought that the tube did not enter the stomach, but a dilated œsophagus, or a diverticulum. The X-ray examination after a bismuth meal showed the condition which was present (Figs. 10 and 11). There is a diffuse dilatation of the œsophagus which has

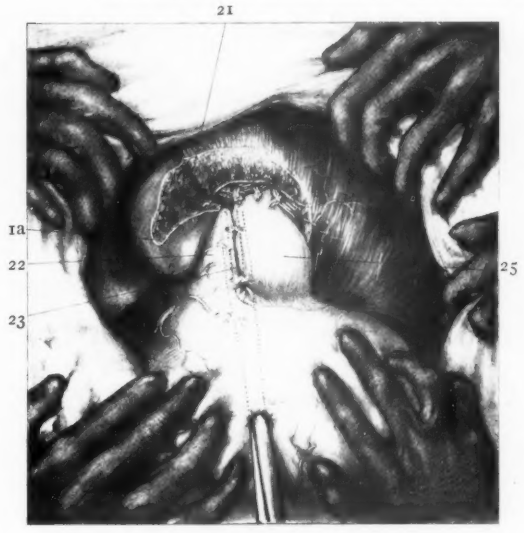

Fig. 14. Showing clamp *in situ* including between its blades a portion of dilated œsophagus (25). Cardiac opening of stomach and a portion of stomach contiguous to cardiac opening (22). 1a, cut edge of left lateral ligament of liver on liver; 21, re-entrant angle between liver and diaphragm; 22, portion of stomach contiguous to cardiac opening; 23, line of union between stomach and œsophagus; 25, dilated lower end of œsophagus.

Fig. 15. X-ray lateral view 6 weeks post-operative, showing lumen of œsophagus still larger than normal. Note presence of portion of bismuth in the stomach.

also become lengthened and a pouch or dead space to the right of the cardia, resting on the diaphragm, can be readily distinguished, an "S"-shaped form of dilatation. There is no evidence of any of the bismuth having entered the stomach.

Dr. H. H. Janeway examined the interior of the œsophagus by means of his œsophagoscope. The cardia was readily made out and it was dilated by passing several graded bougies through it. There was no improvement after the passage of these bougies and the patient was transferred to Dr. Blake's service.

Operation. Dr. Lambert. Local anæsthesia, four per cent novocaine. A gastrostomy was performed through the upper third of left rectus under local anæsthesia. A Kader operation was done, inverting a funnel of gastric wall over a catheter by means of three purse-string sutures.

At this time the patient's general condition was poor, as she was reduced to a very low ebb, and the degree of emaciation was extreme. She made an uneventful post-operative recovery, and gained rapidly and steadily in weight. Her feedings by means of the gastrostomy gave her no discomfort, and the leakage from the opening was so slight that there was no irritation or ulceration of skin of abdominal wall in neighborhood of the fistula.

September 5th, four months after the gastrostomy, she had gained over 50 pounds and weighed 120 pounds. On two occasions, September 5th and 16th, the patient was given a string to swallow, with the hope that it would enter the stomach and so serve as a guide on which to pass some dilating apparatus. On each occasion, after 24 hours, the patient had a chill, felt nauseated, and had a rise of temperature to 102.5°, with a rise of pulse rate to 120. She would then vomit a large quantity of foul material, together with the string and would then feel perfectly well, while the temperature would drop to normal and remain so.

A string was passed from below into the œsophagus by means of a cystoscope, and was seized by Dr. H. H. Janeway through the œsophagoscope and drawn up through the mouth. By means of this string, using it as a guide, several graduated bougies were passed through the cardia, but with no beneficial results. No food passed into the stomach when taken by mouth. The cardia was then dilated by means of the Plummer apparatus. The dilator passed without difficulty but there was absolutely no improvement following repeated dilation.

Operation. Dr. Lambert, February 1, 1913. Patient was given ether and a cardioplasty was performed as follows: The peritoneal cavity was opened by a median incision which extended from the ensiform cartilage to the umbilicus. A second incision then extended to the left from the umbilicus

transversely to the tip of the tenth rib, in anterior axillary line. The seventh, eighth and ninth ribs were divided near the attachment of their cartilages through an incision beneath the left mammary gland. The pleural cavity was not entered. The stomach was then freed from the anterior abdominal wall by dissecting the gastrostomy free. This was then temporarily closed by a purse-string suture. The abdominal flap was then reflected upward, being hinged on the line of the ribs which had been divided. The left lateral ligament of the liver was divided and the liver was drawn downward and to the right while the stomach was pulled downward and to the left. This gave a perfect exposure of the cardiac opening of the stomach (Fig. 12). The diaphragm was then incised from the edge of the cardiac opening toward the right and slightly forward. The pleura was accidentally opened during this procedure as the incision was carried to the left of the œsophagus. This opening was immediately closed by a plain catgut suture. Through the hole in the diaphragm the lower end of the dilated œsophagus was freed from surrounding structures by blunt dissection with the index finger. A bougie passed down the œsophagus through the mouth was arrested in the extreme right portion of the dilatation. The end of the bougie and pouch of œsophagus were then drawn down through the opening in the diaphragm into the abdomen and the œsophagus was fixed in this position by interrupted plain catgut sutures, uniting it to the opening in the diaphragm. By this procedure there was established a straight tract from the pharynx to the opening through the diaphragm, and the redundant portion of the dilated œsophagus, which formed the reservoir for food and the dead space, was brought into the abdomen (Fig. 12). The purse-string suture closing the gastrostomy opening was divided and a long clamp was passed through the gastrostomy opening into the stomach. One blade of the clamp was then passed through the cardia into the dilated portion of the œsophagus, lying within the abdomen, while the other blade of the clamp remained within the stomach. The clamp was then closed sufficiently to hold firmly, but not to cut through the structures included between the blades, namely, a portion of dilated œsophagus and a portion of stomach including the cardiac opening, and the clamp became an œsophago-gastrotribe, similar in principle to the enterotribe (Fig. 14).

A row of Lembert sutures of chromic catgut united the contiguous portions of dilated œsophagus and stomach, a few interrupted sutures of chromic catgut united the diaphragm to the œsophagus. A catheter of soft rubber was placed in the stomach through the gastrostomy opening alongside of the handles of the clamp. The gastrostomy was then re-established by two purse-string sutures, Kader method, and attached to abdominal wall. A double rubber tube drain was placed down to site of line of union between stomach and œsophagus, and brought out of median wound; a second double rubber tube drain was placed between stomach and spleen and brought out at extreme left of incision. Abdominal wall closed, continuous plain catgut No. 1 for peritoneum; interrupted plain and chromic sutures for muscles and aponeuroses; silkworm gut, interrupted and continuous silk for the skin. The incision beneath the left breast was closed by interrupted silkworm-gut and continuous silk. Sterile dressing.

Fig. 16. X-ray, lateral view, four months post-operative, showing that lumen of œsophagus has still further contracted. Note presence of bismuth meal in stomach.

Time of operation, 2 hours and 20 minutes. Patient stood the manipulation and the operation fairly well, and showed only a moderate degree of shock. She lost only a small amount of blood during the entire procedure.

Post-operative course. The wounds healed with a moderate degree of reaction. There was considerable oozing from the drainage tubes, which was purulent and of a foul odor. This gradually cleared up. The clamps were allowed to remain undisturbed for four days when they were tightened to their full extent, crushing all structures included between them. They were removed on the ninth day post-operative.

There developed on the second day post-operative a dry pleurisy in the left pleural cavity, accompanied by a bronchitis with a thick, tenacious sputum. She experienced considerable difficulty in raising the expectoration and it caused her a great

deal of pain. These two conditions cleared up at the end of ten days. She received no nourishment for three days after operation, but small quantities of water through the gastrostomy. On the fourth day post-operative she was given liquid nourishment through the gastrostomy. The twenty-eighth day post-operative, she took liquids by mouth and solid food on the thirty-third day, when feeding by the gastrostomy was stopped.

During the first four weeks there was some bleeding from the site of anastomosis as evidenced by a marked reaction for blood in washings of dilated œsophagus. This gradually diminished and finally ceased. She was allowed out of bed on the thirty-fourth day. She regurgitated small amounts of food for several weeks but this has now ceased and the patient considers herself well, as she eats everything she desires and has neither any discomfort nor vomiting. She has gained enormously in weight.

X-ray taken six weeks after operation shows the bismuth meal has passed into the stomach. The lumen of the œsophagus is still larger than normal (Fig. 15). An X-ray taken four months after the operation shows that the lumen of the œsophagus has still further contracted, but has not yet returned to normal size (Fig. 16).

CONCLUSIONS

1. There is a small number of cases of dilatation of the œsophagus, as a result of cardiospasm, which require operative interference in order to remain permanently cured.

2. This group comprises those cases in which the œsophagus has lengthened in addition to having become dilated and in consequence has the form of an "ſ"-shaped curve.

3. These cases may be successfully treated from within the abdomen, without fear of infection to the pleuræ or mediastinum.

4. A preliminary gastrostomy, through which the patient may gain nourishment, and so improve the nutrition and power of resistance, is an advantage.

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THE RELATIONSHIP BETWEEN THE URINARY SYSTEM AND DISEASES OF THE FEMALE PELVIC ORGANS

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SYMPTOMS referable to impaired bladder function play an important rôle in the clinical history of many pathologic conditions of the female pelvic organs. Its intimate anatomical relationship with the surrounding genitalia renders the bladder especially vulnerable to adjacent pathology, whether this be in the form of neoplasm, infection, or displacement. It is undoubtedly true that in the majority of such cases, the bladder is the only portion of the urinary tract affected, and with the removal of the primary cause the bladder symptoms will likewise be relieved. On the other hand, there is a second and by no means small group of cases in which the pathology of the urinary tract is more extensive, involving the ureter and kidney as well; or, disease of the urinary system may exist coincidentally with that of the genital tract, the one entirely independent of the other so far as etiology is concerned. The frequency with which an improper conception of the underlying pathology has prompted the correction of some minor gynecological abnormality when the actual lesion lies in the kidney or ureter opens up another possibility of error to the surgeon who limits his horizon to the pelvic organs or attempts to make his diagnosis from the interpretation of symptoms alone.

That the bladder should be a frequent participant in diseases of the genitalia, whatever their nature, is self-evident even to the most casual observer. Such interference is produced not only by distortion of the bladder walls through sacculation, pressure, or traction, which express themselves by symptoms of mechanical blockage to the passage of urine, but also by actual and often extensive changes in the muscular and mucous coats. These changes are due either to a superadded infection or impaired circulation, which affect chiefly the base of the bladder and are caused by partial obstruction of the venous or lymphatic current.

In view of the fact that evidence of some abnormality of the bladder is furnished by pronounced and definite complaints, we are prone to limit our explanation of the symptoms to this portion of the urinary tract, without considering the possibility of involvement of the ureters or kidneys. When we consider the anatomy of the ureters, it is only logical to assume that they must become involved in a certain proportion of cases, and that such an assumption is correct will be readily proven if this possibility is borne in mind and appropriate examinations made to determine it.

In their passage through the pelvis to the bladder, the ureters occupy a position which renders them liable to injury from disease of the pelvic viscera. That portion lying proximal to the parametrium is less frequently subjected to direct injury, but may be compressed by an impacted tumor, a dense inflammatory exudate, or glands which are the seat of metastatic carcinoma. The distal portions of the ureters as they pass through the parametrium, along the anterior vaginal wall and obliquely into the bladder, are brought into the most intimate contact with abnormalities of the uterus and vagina, and it is here that secondary involvement is most likely to occur.

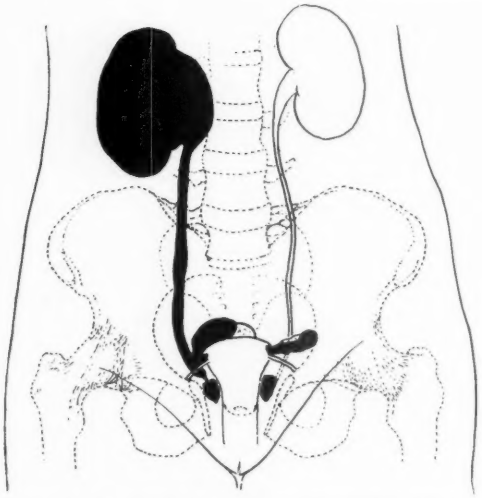
The end-results of ureteral involvement fall into two broad groups — the one of purely mechanical origin, expressed by dilatation of the ureter and renal pelvis, and the other due to infection. In the light of experimental as well as clinical evidence, infection of the ureter and pelvis of the kidney is usually a secondary manifestation; the primary factor which paves the way for the development of infection lies in a partial or a complete obstruction of the ureteral lumen, resulting in urinary stasis, dilatation of the ureter and pelvis with subsequent infection, which may be of hæmatogenous, lymphatic, or urogenous origin.

The possibility of ureteral compression in massive new growths, such as carcinoma of the cervix, and intraligamentary or impacted myomata, is commonly recognized; that such an occurrence may be associated with other and even more frequent anomalies is not sufficiently appreciated. Under normal conditions, the base of the bladder, especially the trigone, often presents an entirely different picture during the menstrual and intermenstrual periods; incident to the pelvic engorgement occurring immediately before and during menstruation, the muscularis and mucosa become acutely congested, swollen and œdematous. Clinical evidence of this fact is afforded by the frequency of minor vesical symptoms under normal conditions and the exacerbation of symptoms with cystitis during the menstrual flow. Given an abnormally small ureteral orifice, this recurrent swelling of the surrounding tissues may be sufficient to produce urinary stasis and subsequent dilatation of the ureter and pelvis of the kidney, as has been so ably pointed out by Mirabeau, who claims that he has encountered several cases of dysmenorrhœa arising from this cause. Further proof of this possibility is seen in cases of intermittent hydronephrosis in which the increase or onset of symptoms is often associated with menstruation.

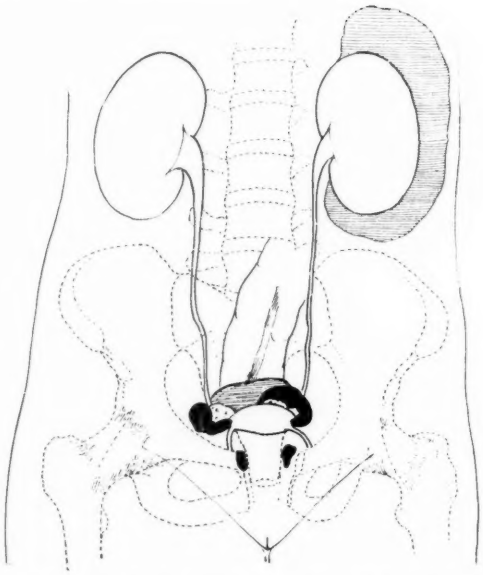
As a digression, but still a pertinent thought in this connection, we would suggest that this factor may play a part in explaining the frequency of right-sided pyelitis. In women, a freely movable right kidney is a frequent finding, and temporary retention of urine in the pelvis incident to partial obstruction of the distal portion of the ureter would, by its added weight, tend not only to hold the kidney in its lowest position, but also to exaggerate the angulation between the fixed and movable portions of the ureter, this in turn adding a second source of obstruction to be overcome. Under such circumstances, it seems logical to assume that a greater length of time would be consumed to relieve this retention than would be the case with the left kidney, which is situated high and is usually well fixed, affording free and immediate drainage with removal of the distal obstruction. Thus, as the result of repeated though transient retention, a gradual dilatation ensues, a more or less permanent urinary stasis results, and upon this, infection is engrafted. That dilatation of the pelvis and ureter is commonly associated with pyelo-ureteritis can be readily demonstrated by collargol injection and it has been looked upon as the result of inflammatory changes. According to our theory, the dilatation is primarily of purely mechanical origin, and may be secondarily exaggerated not only by swelling of the ureteral mucosa, which diminishes its lumen, but also by inflammatory changes in the walls of the renal pelvis and ureter which weaken their resistance to internal pressure.

Changes in the bladder, which may be seen in benign as well as malignant growths of the uterus, are so commonly recognized as to deserve but passing mention. Suffice it to say that as the result of distortion of the bladder walls, direct extension of a malignant growth, and impaired circulation due to pressure, these alterations may be of a sufficient degree to act as a contributory factor at least in the production of ureteral obstruction. Likewise, pelvic infection may exert its influence not only on the bladder but the ureters and kidneys as well; that infection of the parametrium has greater potential possibilities of secondary involvement of the upper urinary tract than that located within the peritoneum is self-evident, for in the former, the disease is in actual contact with the walls of the ureters. During the stage of active infection, pyelitis or pyelonephritis may result from direct extension up the ureter. That partial obstruction of the ureter is associated with an ascending infection is well demonstrated in the following case:

CASE 1. Age 25. Married six years. No children. Menstrual history normal. Leucorrhœa present, but not profuse. The present illness was of about five years' duration, beginning with frequent and painful urination. One year later she had "severe pain in the vagina," and her physician discovered an abscess, which was opened and drained. Shortly afterward he informed her that she had a "fistula in the vagina." There has been no incontinence of urine. Two years ago an abscess of the right Bartholin's gland necessitated evacuation. Burning pain along the urethra and frequency



Case 1. Extensive pelvic gonococcal infection; bilateral parametritis with stricture of the right ureter. Dilatation of ureter above stricture and pyonephrosis of gonococcal origin.



Case 2. Bilateral pyosalpinx with pelvic abscess; secondary perinephritic abscess; cultures from both showed colon bacillus infection.

of urination were the chief complaints on admission to the hospital. She has had several attacks of pain in the lower abdomen, but none recently. This pain was usually bilateral and lasted from two days to one week. She occasionally has experienced pain beneath the right costal border and in the lumbar region, which was independent of food or posture. Has never had hæmaturia, but the urine is constantly cloudy.

Abdominal examination: Tenderness over the lower abdomen. Distinct resistance in the upper right quadrant. The right kidney was somewhat enlarged, tender, and movable.

Vaginal examination: Induration of the right labium, which presented a small opening on its inner surface. Uterus in anteflexion. Both ovaries and tubes enlarged and adherent. Bilateral thickening of parametrium.

Urinalysis: Large amount of pus. No red blood cells. No tubercle bacilli were found either by smear or inoculation of guinea pigs.

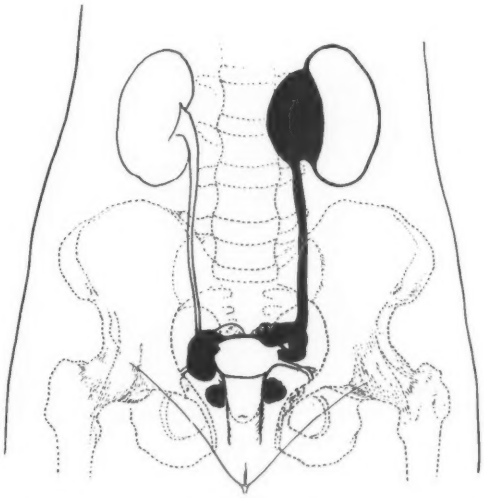
Cystoscopic examination: Urethral stricture of large caliber situated about one-half inch in front of internal sphincter. On passing a probe through the opening in right labium and a catheter into the urethra, the two met just behind the stricture. Bladder capacity, six ounces. On the right side of the bladder base, just external to the ureteral orifice, was an area of superficial ulceration. The orifice was small, thickened and reddened, and from it pus could be seen escaping. The left ureteral orifice was normal. Small superficial ulcerations were present in the base of the bladder. Indigo-carmine appeared from the left side normally in nine minutes; no excretion from the right in thirty minutes. Right ureter catheterized for a distance of six centimeters, where an impassable obstruction was met. Examination of the secretion from the right ureter showed pus, which contained only Gram negative, intracellular diplococci. Thirty-five cc. of a 10 per cent collargol solution were injected into the right ureter without discomfort. Skiagraph showed a greatly dilated ureter above the stricture as well as dilatation of the renal pelvis.

Diagnosis: Stricture of the urethra. Urethrovaginal fistula. Chronic parametritis and salpingo-öophoritis. Chronic ulcerative cystitis. Stricture of right ureter and pyelonephritis of gonorrhœal origin.

Patient still under observation.

In case the infection travels along the lymphatics, paranephritis may be the sequel.

Case 2. Age 20. Single. Menstrual history normal. Seven months prior to admission, a vaginal puncture was performed for pelvis abscess of tubal origin. The present trouble began four weeks ago with acute pain low down in the left side of the abdomen. Shortly afterwards a mass was detected beneath the left costal border, which has gradually increased in size and is extremely tender, especially posteriorly. Chills and fever have developed, coming on usually at night. There has been no irritability of the bladder.



Case 3. Old pelvic inflammatory disease and parametritis with secondary partial obstruction of the lower portion of the ureter resulting in hydro-ureter and hydronephrosis.

Vaginal examination: Bilateral tenderness and infiltration of the parametrium.

Abdominal examination: Indistinctly fluctuating, tender mass in the left lumbar region.

Urinalysis: Normal.

Cystoscopic examination: Bladder normal. The left ureter was catheterized and the urine collected showed no pus.

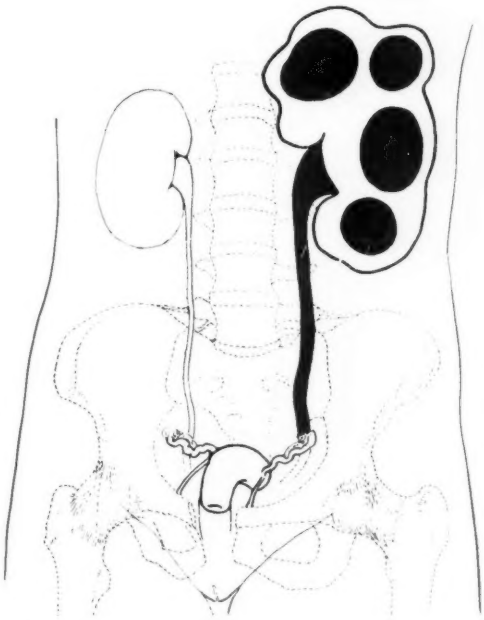
Diagnosis: Perinephritic abscess, secondary to pelvic infection.

Operation: Evacuation and drainage of perinephritic abscess.

Drainage removed in five days. The patient was discharged from the hospital cured in two weeks.

With subsidence of the acute process, the parametrium is transformed into dense, fibrous tissue, which by its contraction may compress the ureter and lead to the formation of hydronephrosis.

CASE 3. Age 31. Married. Six years ago the uterus and adnexa were removed on account of extensive inflammatory disease. The patient was sent to the hospital for the repair of a large incisional hernia and on account of intermittent pain supposedly due to intestinal adhesions. Two years after operation left-sided pain developed, which has been of a decidedly intermittent character with intervals of comparative comfort. The pain developed slowly, starting as a dull ache in the left lumbar region and increasing within a few hours to actual colic which required morphine for relief. The acute distress persists for ten or twelve hours



Case 4. Acute retroflexion of the uterus associated with vesicle symptoms due not to retroflexion but to left side tuberculous pyonephrosis.

and then gradually subsides. The pain extends downward into the pelvis and left thigh. Eating has no influence either in producing or relieving the pain; constipation seems to favor the development of these attacks. So far as she can remember, there is no increase in the amount of urine voided with subsidence of the attacks. There is frequency and urgency of urination, and once blood was noticed.

Vaginal examination: Infiltration in both vaginal fornices.

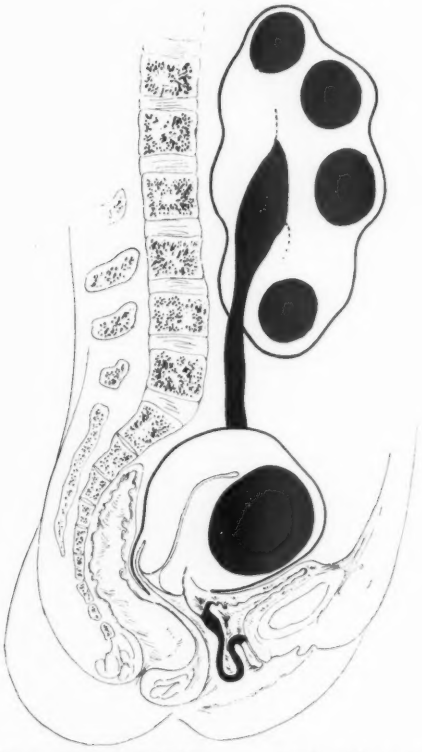
Abdominal examination: Large incisional hernia, otherwise negative. The left kidney is not palpable nor is there tenderness in the lumbar region.

Urinalysis: Normal.

Cystoscopic examination: Cystitis colli with papillary hypertrophy of the internal sphincter. The ureteral orifices present a normal appearance; the contractions on the right are more frequent than on the left. The left ureter was catheterized. Urine collected, normal. Sixty-three cc. of a 10 per cent collargol solution injected when the patient complained of a sensation of fullness in left kidney region. Skiagraph showed dilatation of the ureter and hydronephrosis.

Diagnosis: Incisional hernia. Left hydronephrosis and hydro-ureter.

Operation: Left nephrectomy. Repair of hernia. Operative recovery uneventful. In excellent health two years after operation.



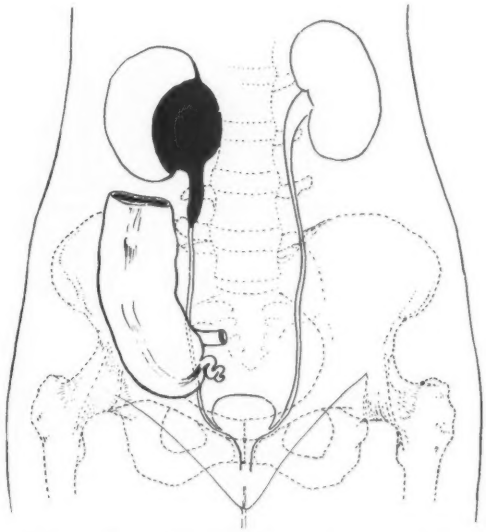
Case 5. Vesical irritability associated with a large myoma uteri and prominent cystocele; cystoscopic examination revealed tuberculosis of the left kidney.

In cases of extensive prolapsus uteri and cystocele, ideal conditions are presented for the development of complications on the part of the ureter and kidney. The possibility of such an occurrence was first called to our attention in studying the illustrations which Tandler and Halban present in their monograph on the topography of the ureter, where they show a marked dilatation of both ureters accompanying prolapse of the uterus. Under these conditions, there is not only a sacculation of the bladder, but an actual descensus of the trigone, a gliding, as it were, to the lowermost portion of the anterior cervical wall. The ureters must of necessity accompany this descensus and are, therefore, subjected to more or less torsion in their abnormal position. Pursuing this phase of the subject further, we find still other factors

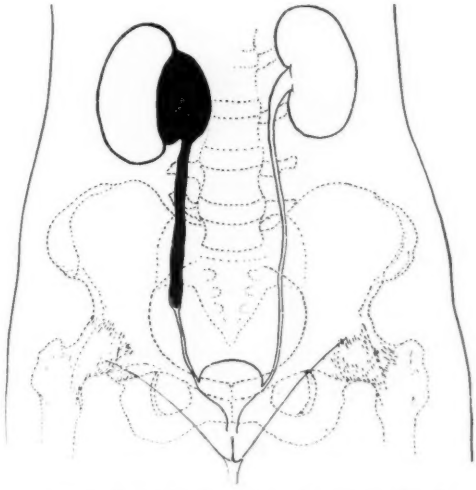
Case 6. Hæmaturia associated with a large myoma uteri. Cystoscopic examination showed a primary carcinoma of the bladder.

which contribute not only to partial obstruction and dilatation of the ureters but also to their infection. Cystoscopic examination of the prolapsed bladder often shows, besides a low trigone, marked thickening of the mucosa and muscular wall and not infrequently extensive œdema bullosum; should infection supervene, these changes are exaggerated by those of a true cystitis. Under either condition, the ureteral orifices are surrounded by a swollen mucosa which offers some impediment to the normal flow of urine. Some degree of residual urine is a common accompaniment of an extensive cystocele and to this stagnation, infection may be added, so that the ureteral orifices are literally bathed in a pool of infected urine. Given, therefore, a partial obstruction of the terminal portions of the ureters, an extension of the infection to the pelvis of the kidney is extremely likely. We are confident that an associated pyelitis is responsible in some of those cases of vesical symptoms which persist even after operative correction of the prolapsus or cystocele.

In passing, we would say a word with regard to the influence of an uncomplicated



Case 7. Right-sided abdominal pain, supposed to be due to either appendicitis or cæcum mobile; further examination disclosed presence of dilated ureter and pelvis.



Case 8. Calculus impacted in the lower portion of the ureter giving symptoms suggesting appendicitis; calculus detected only after injection of collargol, which revealed marked dilatation of the ureter and renal pelvis.

retroflexion in the production of vesical symptoms. A study of these cases has proven to us that the malposition, *per se*, rarely causes sufficient distortion of the bladder base to make itself manifest by urinary disturbances; given such a complication in the presence of a retroflexed uterus, it is a safe rule to assume that some other intra- or extravesical lesion is present and its exact nature must be determined by appropriate examinations. This is illustrated by the following case:

CASE 4. Age 20. Menstrual history normal. Six months prior to admission to hospital, the uterus was suspended for the relief of bladder symptoms. The present illness is of one year's duration, beginning with general weakness, loss of appetite and burning urination. The bladder symptoms have increased in severity until at present she has a constant desire to void, passing small quantities of cloudy, foul-smelling urine. She suffers from pain across the back, especially in the left lumbar region. There has been a rapid loss in weight and strength until now she is practically bed-ridden. For several weeks there has been irregular fever with chills and profuse sweats.

Vaginal examination: Uterus, tubes and ovaries, normal. Base of bladder thickened.

Abdominal examination: Large, tender and firmly fixed mass beneath the left costal border, extending backward, filling the lumbar region.

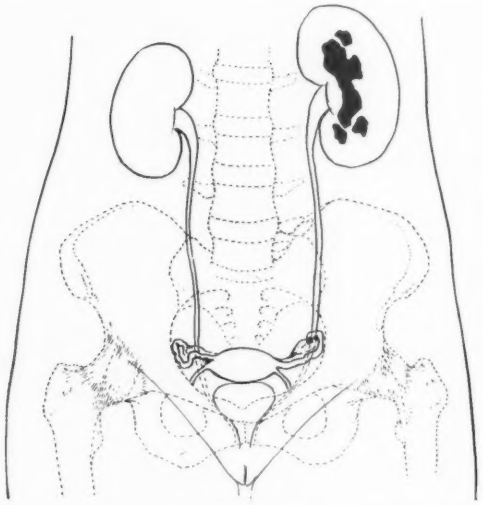
Cystoscopic examination: Bladder capacity reduced to less than three ounces. Diffuse ulcerative cystitis. The right ureteral orifice was normal; the left, transformed into a large crater with irregular, indurated and ulcerated edges. Indigo-carmin appeared from the right side in nine minutes as a dark blue stream. No excretion from the left.

Urinalysis: An abundance of pus and many red blood cells.

Diagnosis: Tuberculous pyonephrosis.

Operation: Tuberculous pyonephrosis with superadded colon bacillus infection. Nephrectomy impossible. Drainage. Sinus discharging freely eight months after operation. General health failing rapidly.

While it is essential to have in mind these lesions of the urinary tract which are of a purely secondary nature, the possibility of a primary disease of the kidney or bladder being a complication of the pelvic pathology is even more important so far as prognosis and treatment are concerned. The findings on pelvic examination may be sufficient to warrant the conclusion that the symptoms are explained solely by some pelvic lesion, while in reality this is of but minor importance. Routine use of the cystoscope in all cases presenting bladder symptoms will soon prove that such complications are by no means rare. Two cases prove the importance of this statement.



Case 9. On account of left-side pain, tubes and ovaries had been removed without relief; the actual lesion consisted of multiple calculi in the left kidney.

CASE 5. Age 49. Mother of five children. Previous medical history negative. According to the statement of her physician, a fibroid has been present for over twenty years but until a few years ago had not increased in size and has not been productive of symptoms. Recently, however, there has been an increase in the quantity of blood lost at the time of the periods, which last two or three days longer than formerly. Until three years ago, she had experienced no symptoms referable to the bladder aside from occasional incontinence of urine, which was controlled by a pessary; since then, there has been increasing frequency of urination with terminal pain. This is always increased when standing and relieved to some extent by the recumbent posture. Hæmaturia has never been present. There are no symptoms referable to disease of the abdominal organs.

Urinalysis: Numerous pus cells. Cultures of urine, sterile. Tubercle bacilli found in urinary sediment as well as by inoculation of guinea pigs. Skiagraph showed two indistinct, irregular shadows at the lower pole of the left kidney.

Vaginal examination: Extensive relaxation of the pelvic floor with large cystocele and rectocele; myoma uteri reaching over half-way to umbilicus.

Abdominal examination: Negative; the left kidney is not palpable nor is there lumbar tenderness.

Cystoscopic examination: Several superficial ulcerations at base of the bladder. The right ureteral orifice is normal; the left is transformed into a large, rigid, craterlike opening with ulcerated edges. Urine from right kidney normal.

Diagnosis: Cystocele and rectocele. Myoma uteri. Tuberculosis of the left kidney and ureter.

Operation: Anterior and posterior colporrhaphy. Supravaginal hysteromyomectomy. Left nephrectomy and partial ureterectomy.

Pulmonary embolus ten days after operation which retarded her convalescence. Otherwise there has been a steady improvement in her general health with almost complete relief of vesical symptoms.

CASE 6. Age 50. Single. For the past five years, the patient has suffered from a rheumatoid arthritis. Until three years ago, menstruation was normal; since then, the periods have gradually increased in duration as well as quantity, and at present they last over two weeks and at times large clots are passed. No bleeding between periods. About one year ago she noticed that the urine was of a dark red color and she was told by her physician that it contained blood. Since then, hæmaturia has been observed on frequent occasions with intervals during which the urine has been normal in color. Profuse hæmorrhage from the bladder has never been present; only rarely are clots passed, at which time she experiences considerable pain. Increased frequency of urination, as a rule without dysuria, has been a recent development.

Vaginal examination: Myoma reaching almost to umbilicus.

Cystoscopic examination: Primary carcinoma situated on the left side of the bladder, just external to the ureteral orifice.

Diagnosis: Myoma uteri. Primary carcinoma of bladder.

Operation: Supravaginal hysteromyomectomy; partial excision of bladder and implantation of left ureter.

A left-sided pyelitis developed on the tenth day after operation with acute symptoms lasting three days, otherwise the patient made a good operative recovery. Cystoscopic examination three months after operation shows no evidence of recurrence.

There remains another class of cases far too common in these days of accurate renal diagnosis, in which the appendix or ovaries are excised in the belief that they are the offending organs, when the only focus of disease lies in the kidney or ureter. Every surgeon has met such mistakes in the practice of others as well as his own, and when the final reckoning is taken, these errors are to be explained only on the ground of hasty conclusions based upon insufficient data to warrant a correct diagnosis. Differentiation between lesions of the urinary system and those of the appendix, gall-bladder, or ovary may be quite impossible from symptoms and physical findings alone; in these doubtful

cases, the modern methods of cystoscopic examination will rarely fail to prove or disprove the integrity of the kidney and ureter, while neglect of this procedure may result in failure to locate the cause of trouble and consequently in misdirected treatment. While numerous instances could be cited where one or more operations had been performed for some supposedly intra-abdominal lesion when in reality the kidney or ureter was at fault, we will present but three which have come to our notice recently.

CASE 7. Age 29. Married. Mother of two children. Menstruation regular, duration three to five days. Severe pain across lower abdomen during the first two days. The present condition dates from the birth of her second child, five years ago. She has suffered almost constantly from severe sacral backache as well as intermittent attacks of right-sided abdominal pain. Four years ago the appendix was removed and for a time she seemed better. During the past year these attacks have reappeared with increasing frequency and severity and she has been troubled with "indigestion" as expressed by epigastric pain, eructation of gas, and vomiting after eating. She has never vomited blood. No jaundice. As a general thing, the bowels are regular with occasional diarrhœa of one or two days' duration. The attacks of severe abdominal pain appear at irregular intervals and usually come on at night. They have no relation whatever to eating or the condition of the bowels. The point of most acute pain is located at the outer border of the right rectus on a level with the umbilicus. At times the colic is so severe that morphine does not give relief, and nausea and vomiting are often associated. With the attacks there are no bladder symptoms and the temperature remains normal. During prolonged rest in bed, the pain completely disappears, only to reappear when she is up and about. As the result of continuous suffering, she has become very nervous, with considerable loss in weight and strength.

Abdominal examination: Poor musculature and diastasis recti. Cæcum palpable and tender. Right kidney palpable. During an attack, exquisite tenderness extended from the right iliac fossa to the costal border, and was increased on deep inspiration. No enlargement of the kidney could be detected.

Vaginal examination: Negative.

Urinalysis: Negative.

Skiagraph of the kidney and ureter negative for calculus. The stomach was somewhat dilated and the colon ptosed, with large freely movable cæcum.

Cystoscopic examination was not made because the symptoms indicated gastro-intestinal rather than renal origin.

At a second operation a thorough examination was made of the abdominal organs and no abnormalities could be found. The right kidney was freely movable, but no enlargement could be detected. Flail-like cæcum suspended to lateral abdominal wall. Following the operation and until she resumed her regular activities, she was free from pain. It then returned and has exhibited the same characteristics as before operation. In order to determine the condition of the right kidney a cystoscopic examination was performed.

Bladder normal. Right kidney catheterized — 25 cc. of a 10 per cent collargol solution were injected. The skiagraph shows a marked dilatation of the renal pelvis and upper ureter with displacement of the kidney downward and inward.

Diagnosis: Nephroptosis with angulation of upper ureter and secondary intermittent hydronephrosis.

CASE 8. Single. Age 29. Menstrual history negative. Present illness: Two years ago she was seized with acute pain beneath the right costal margin which soon changed its position to the right iliac fossa. The pain was accompanied by nausea and vomiting and lasted for several hours until relieved by a hypodermic injection of morphine. For ten days following the subsidence of acute pain, tenderness remained in the right side of the abdomen. Four months later she had a similar seizure, and since then the attacks have been frequently repeated and usually come on with the menstrual period. Of late, the pain has been referred down the outer side of the thigh as far as the knee. She states that following the attacks pus and blood have been present in the urine. There has been no bladder irritability either with or between the attacks. Referred to hospital with diagnosis of appendicitis.

Vaginal examination: Negative.

Abdominal examination: Tenderness in the right iliac fossa as well as in the right costo-vertebral angle. No mass is palpable.

Urinalysis: Shows from 5 to 15 leucocytes to the field. No red blood cells and no casts.

Skiagraph: Negative for renal or ureteral calculus.

Cystoscopic examination: The vessels at the base of the bladder are somewhat congested but otherwise the mucosa is normal. The ureteral orifices present no abnormalities either in appearance or in character of their contractions. The right ureter was catheterized and an impassable obstruction was met 13 cm. from the ureteral orifice. At a second examination, a smaller catheter was passed, which met an obstruction at the same point as on the previous occasion. Twenty cc. of an 8 per cent collargol solution were injected; skiagraph showed catheter leading to a shadow in the ureter the size of a pea. Above this, the ureter as well as the renal pelvis was markedly dilated.

Diagnosis: Ureteral calculus.

Operation: Transperitoneal ureterolithotomy. Appendectomy.

Uncomplicated convalescence and in good health one year after operation.

CASE 9. Age 52. Mother of four children. Aside from present trouble, the patient has always been in good health. For about thirty-two years, she has had a dull aching pain in the left iliac region with only occasional sharp pains of short duration radiating into the vagina. Several years ago the tubes and ovaries were removed on the assumption that they were at fault, but the same pain has persisted. For a few weeks prior to admission to the hospital, there have been several mild attacks of pain in the left lumbar region; the pain shows no radiation, is unassociated with bladder disturbances and shows no relation to the taking of food, posture, or constipation. No symptoms referable to the abdominal organs.

Vaginal as well as abdominal examination negative; slight costovertebral tenderness on the left side.

Urinalysis: Many erythrocytes and pus cells.

Cystoscopic examination: The right ureteral orifice is normal; the left is small, œdematous and reddened. Indigo-carmin appeared on the right side as a faint blue discoloration in 25 minutes with no excretion from the left. Phthalein elimination (whole urine) during the first hour, 50 per cent; the second, 15 per cent. Both ureters catheterized; the urine flowed freely from the right kidney and was normal. From the left kidney, the secretion was greatly diminished and contained many erythrocytes and pus cells. The skiagraph showed multiple calculi in the left kidney.

Diagnosis: Multiple calculi in left kidney.

Operation: Left nephrectomy. Only a shell of renal parenchyma remained.

Patient made an uneventful recovery. It is interesting to note that the phthalein elimination was the same after operation as before.

Realizing that lesions of the urinary system may occur either as complications or sequelæ of disease of the female pelvic organs, we cannot urge too strongly the importance of determining their exact nature before resorting to an operation, which otherwise may be inadequate or even unnecessary. Experience in a large number of these cases has taught us that the solution of this problem cannot be gained from dependence upon symptoms; they can only serve as an indicator which points to the necessity of further investigations. Whether we are dealing with primary disease of the kidney or abnormalities of the pelvic organs which encroach upon the bladder, the subjective manifestations common to both are often limited to vesical symptoms. The relationship of the one to the other can be definitely determined only by a thorough examination of the bladder, ureter, and kidneys. A routine cystoscopic examination in all cases presenting vesical disturbances, irrespective of the coincident pelvic pathology, should be the rule, for only by following this precaution can grave errors in diagnosis be avoided.

DIAGNOSIS AND TREATMENT OF BORDER-LINE PATHOLOGICAL LESIONS[1]

By JOSEPH COLT BLOODGOOD, M. D., Baltimore, Maryland

A BORDER-LINE pathological lesion may be defined as one in which it is difficult to differentiate whether it is benign or malignant, either from the clinical history and examination, or from the gross appearance, or from the microscopic section.

In some cases this differential diagnosis is not essential for treatment, because the entire lesion can be radically removed without danger or mutilation.

In many instances, however, the differential diagnosis between the benign and malignant leads to an operative removal essentially different, and when this diagnosis is made, the patient is insured the best chances of a cure if the lesion be malignant, and the least mutilation if it be benign.

The development of the diagnosis of border-line pathological lesions will keep pace with the number of patients who seek advice in that early period of the disease in which this diagnosis is difficult.

It has only been in recent years that the number of these border-line pathological lesions has increased. That it has increased during the period of greatest development in clinical, gross and microscopic diagnosis, is evidence that patients are seeking advice with lesions in an earlier stage, and these lesions, clinically and pathologically, are presenting different pictures.

In the past two years I have seen more border-line breast lesions than in the previous twenty.

In the past few years, also, surgeons have been investigating with much greater accuracy and on a larger scale their ultimate results after operations for malignant disease. The following facts have made a great impression on them.

In every group of malignant tumors there is a large number, often as much as fifty per cent, who come for surgical help after the malignant disease has extended beyond operable removal. Now, in these cases, except in a few instances of internal cancer, there is no difficulty in making the diagnosis clinically, in the gross, or from a microscopic section.

These patients are doomed. As yet we have found nothing for their help. Granting a few cures with X-rays, radium or serum, the number uncured is sufficiently great to be impressive. All of these patients have delayed treatment from ignorance or fear. In every case there had been opportunity for operative relief at a much earlier period.

In another group, as a rule the largest, a diagnosis of malignancy could be made clinically, and the diagnosis confirmed from the gross and microscopic study. In this group, and on account of this diagnosis, the disease has been operated on with every evidence at the operation that the lesion was completely removed. Nevertheless, the number of cures is relatively small — on the average in about twenty-five per cent of the cases.

It is quite true that in some localizations benign lesions may assume all the clinical appearances of the malignant. Yet the number of such cases is so small, and the harm from treating them as malignant upon the clinical diagnosis is so slight, if any, that they need not be considered, except in their exclusion as cured cases of malignant disease in the study of the ultimate results.

In the next group, which in the past has been a small one, but fortunately is increasing, the patients come under observation with

Note.—This contribution will be followed by a series of articles to be published in this journal. These articles will discuss the problem of the early recognition and appropriate treatment of the different lesions in certain definite localizations. The next article will consider lesions of the lower lip; the third, lesions of the tongue and floor of the mouth; the fourth, lesions of the mucous membrane of the gum and cheek.

[1] Read before the American Surgical Association, Washington, D. C., May 8, 1913.

lesions in such an early stage that none of the clinical evidence which in the past we have associated with malignant disease is present. From all clinical evidence the lesion is benign. Nevertheless in the past we have met such cases and at the exploratory operation have found malignant disease.

Up until a few years ago the percentage of cases of cancer of the breast seeking advice when the lesion was still clinically benign was about ten. In the past two years the number of cases has reached almost twenty per cent.

As I stated before, the number of benign lesions which may come under observation with all the clinical appearances of the malignant is relatively small, while the number of malignant lesions which may come for surgical treatment before a clinical diagnosis by the ordinary clinical methods is possible, although relatively small, is very much larger than the previous group, and, due to the education of the public and the profession, is getting larger daily.

The mental attitude of the surgeon to-day toward mistakes in diagnosis must be changed. In the past, for reasons I am unable to ascertain, the surgeon seems to have feared most the performance of radical operation upon lesions clinically malignant, but pathologically benign. In this group the only disadvantage is mutilation. The number of cases could never have been large. Perhaps the fear was due to the fact that in the past the number of cures after operation for malignancy in this stage was so small that every surgeon fought against such extensive operations without the justification of certainty in diagnosis. On the other hand, when malignant disease has come under his care in an early stage in which a clinical diagnosis could not be made, and the surgeon removed the disease as if it were benign and then later found from pathological examination that it was malignant and should have been treated more radically, he, the surgeon, has not felt chagrined, nor felt that he has made anything more than a justifiable mistake. In many instances he has attempted to correct this by immediate secondary and more radical operation. The majority of surgeons do not know the danger of this procedure.

My investigation of a large number of cases shows that the radical operation performed upon a malignant lesion, clinically benign, gives far better ultimate results than an identical operation upon the same lesion at a later period when it is clinically malignant, provided the operation in the earlier stage is performed in one stage. In this group the diagnosis of the lesion should be made at an exploratory incision from the gross appearance with or without the aid of a frozen section. The exploratory incision is cauterized, and the radical operation follows immediately.

In breast lesions the number of cases is so large that we can work out statistics pretty accurately, and these are as follows:

The probability of a cure when the breast cancer is clinically malignant and operable is about twenty-five per cent, while if the breast cancer is clinically benign and the radical operation follows immediately the exploratory incision, the probability of a cure is eighty per cent. However, if the malignant lump only is removed and then, later, days or weeks after the microscopic diagnosis is made, the complete operation is performed, the probability of a cure is less than ten per cent.[1]

In all malignant lesions, in practically every localization, the evidence of the ultimate results supports these conclusions.

The best opportunity for a cure is after radical operation in that early stage of the

[1]NOTE (December, 1913).—Since this article was written the results in cancer of the breast have been computed up until 1913. In 1908 the percentage of five-year cures of cancer of the breast was 35, in 1913 this has increased to 42. This improvement is due to the increase in the number of early cases rather than improvement in the surgery.

The difference between the results in operations upon early cases, where the lump is still clinically benign, in which the diagnosis was made at the exploratory incision and followed at once by the complete Halsted operation, is shown in the following figures:

In adenocarcinoma of the breast there are 15 early clinically benign cases, in which five years or more have elapsed since operation; all are cured, 100 per cent. The results in later clinically malignant cases are 64 per cent. In this group there has been but one local recurrence.

In the more malignant cancers of the breast — medullary and scirrhous — the percentage of cures in the clinically benign cases is 85, of the clinically malignant 33 per cent. These figures are, of course, based on a larger number of cases than those computed in 1908. In both groups the percentage of cures has increased, but the difference remains about the same.

The further investigation of the ultimate results after operation in two stages remains unchanged. In those cases in which the lump was first removed and then, later, the complete operation for cancer was done, there have been no cures. Among the cases in which the breast was first removed and then, later, after microscopic diagnosis, the complete operation for cancer has been performed, there have been no cures. In one case the patient refused further operation. This patient has now remained well seven years, and this represents the only positive cure to-day of an undoubted case of cancer of the breast after an incomplete operation.

Later in this paper I speak of two cures. One of these has since died of cancer.

malignant disease in which a clinical diagnosis cannot be made and in which the diagnosis must be made in some other way. When, however, on account of the difficult diagnosis, the operation is performed in two stages (first, removal of the lesion, and then, after microscopic investigation, after an interval of days or weeks, the radical operation), the probability of a cure is less than in those cases in which the patient has delayed until the diagnosis could be made clinically.

I have investigated this evidence so carefully that it is my belief that I am making no exaggerated statement in regard to the differences in the probability of a cure after operations upon malignant disease, clinically malignant and clinically benign, and the great danger of incomplete operation upon malignant disease when the lesion is clinically benign. I feel that all surgeons and the public should know of these dangers.

At the present time the great majority of surgeons are prepared to treat malignant disease in that late stage when the diagnosis can be made clinically. Their results undoubtedly will differ to a certain extent in proportion to their abilities in the performance of extensive dissections and to their patience in performing these dissections with the greatest amount of painstaking detail. But the actual difference in the percentage of cures will not be very large. Due to the great interest in precancerous lesions, patients all over the country are seeking advice earlier for palpable and visible lesions of the skin and mucous membranes, for lumps in the breast, for pain and swellings about the jaws, for pain and swellings about bones and joints. In many of these cases the disease is in such an early stage that an accurate diagnosis cannot be made from the clinical evidence, and in order to get the best results it must be made at an exploratory incision.

Now, I am quite certain that none will disagree with me in the statement that the majority of surgeons to-day have not prepared themselves to make this diagnosis at the exploratory incision from the gross appearance with or without the aid of a frozen section as accurately as they have diagnosed malignant disease in the late stage without the help of its gross or microscopic pathology. These surgeons have had years of opportunity to examine the gross and microscopic appearance of the various types of malignant disease in the different localizations which they have removed radically, on a diagnosis usually correct, based upon the clinical picture. These opportunities have been lost, and now that the patients are coming earlier with a different clinical appearance, they find themselves unable to employ the older clinical methods and untrained to make the diagnosis from the gross and microscopic pathology at the exploratory incision.

In the Surgical Pathological Laboratory of the Johns Hopkins Hospital, where material is received from many outside sources, our records show that in all groups of cases the number of cases in which tissue is sent to us for diagnosis, tissue removed not radically has increased tremendously. In the past two years we have received more breast tumors than in the previous eighteen, in which only the tumor has been removed and in which our microscopic examination showed cancer. Now, all of these patients had, previous to the incomplete operation, a probability of cure of at least eighty per cent. Now they have ten per cent or less.

Malignant disease in this early stage is not an emergency operation. Surgeons should either prepare themselves to make the diagnosis from the gross or frozen-section appearance at the exploratory incision, or turn this work over to some one who is capable. The responsibility of treatment in the clinically benign stage is far greater than in the clinically malignant stage. Not only is the probability of a cure greater in the early stage, but the danger of any mistake is much greater and the diagnosis is more difficult.

The methods of diagnosis vary with the localization and the character of the lesion. To illustrate the different methods I shall discuss breast tumors, benign and malignant connective-tissue tumors, and some types of epithelial tumors of the skin and mucous membrane.

BREAST TUMORS[1]

The problem of diagnosis here is a very important one, because when a patient seeks advice a few days after a lump in the breast has been observed there are rarely present any clinical signs of cancer. There is no way to make the diagnosis, except by exploring the tumor. It would, theoretically, seem an easy method to excise the palpable mass and subject it to a careful microscopic examination. If this demonstrated the lesion to be benign, no harm would follow. But if it proved to be malignant, my investigation seems to show that the patient's chances of a cure are tremendously reduced by such a procedure.

The percentage of cures among the cases operated upon by Dr. Halsted and his associates in Johns Hopkins Hospital and other hospitals in Baltimore is about forty, after five years. Now, if we consider only those cases which were clinically benign and in which the diagnosis had to be made at the exploratory incision, we find that when the complete operation followed immediately the exploratory incision, the probability of a cure is at least 80 per cent for five years. Among 769 cases of cancer of the breast, in 99 — about 13 per cent — the tumors were clinically benign. In 20 of these cases the tumors only were excised, and later — after some days — the complete operation for cancer was performed. Not one of these cases has been cured. It is only fair to state that this operation was performed by Dr. Halsted or his associates in only two instances. The other eighteen tumors were sent to the surgical pathological laboratory for diagnosis. But I have careful records of the ultimate results. In 15 cases the entire breast was excised; later, after a microscopic examination, in a few the complete operation for cancer was done. So far in this group but two cases were cured — both very early adenocarcinomas. It is possible, therefore, now and then to observe a cure after removal of the breast only for cancer. Here we have 35 cases of cancer of the breast in relatively early stage in which the patients should have had at least eighty chances out of one hundred, in which there have been but two cures — less than six per cent. Contrast with this the 54 cases of cancer of the breast in which the diagnosis was made while the patient was on the table after the exploratory incision and followed immediately by the complete operation for cancer. At least 80 per cent of these patients are remaining well five years and more after operation.

We might deduce from this that it would be the safer procedure to perform the complete operation for cancer in every lump of the breast, but this is contra-indicated by the fact that a large number of relatively young women would be mutilated unnecessarily, and at the same time not completely insured against cancer in the remaining breast.

While we have observed 769 cases of malignant tumors of the breast, we have records of 542 benign lesions. All of the patients suffering with malignant lesions were 25 years of age, or older, at the onset of the disease, while of the 542 patients with benign lesions, about 130 were under 25. Therefore, if a complete operation for cancer had been performed for every lump in a woman over 25, about 50 per cent would have been unnecessarily mutilated.

Therefore, if we are to educate women that a lump in the breast is an acute disease and should be investigated immediately, surgeons must educate themselves to make the diagnosis at the exploratory incision. Although today the number of such cases is relatively small, it is bound to increase if this educational propaganda has the desired effect.

At the present time, when a lump in the breast is explored, it is not difficult to make the diagnosis. We can be quite sure from the gross appearance, with or without a frozen section, that we are dealing either with a benign or with a malignant lesion. In Dr. Halsted's clinic the mistake of diagnosing a cancer as a benign lesion has occurred but twice. This is a fatal mistake. On the other hand, the mistake of treating a benign lesion as malignant, while mutilating, has no element of danger. This has been done much more frequently in this clinic. Among 542

[1] Bloodgood: Senile Parenchymatous Hypertrophy of the Female Breast and Its Relation to Cyst Formation and Carcinoma, Surg., Gynec. and Obst., 1906, December, p. 721; The Clinical and Pathologic Differential Diagnosis of Diseases of the Female Breast, Am. J. M. Sc., 1908, February, p. 157; Cancer Cysts of the Breast and Their Relation to Non-Malignant Cysts, J. Am. M. Ass., October 30, 1909, p. 1475; Kelly and Noble: Inflammations and Tumors of the Female Breast, Gynecologic and Abdominal Surgery, 1908, ii, 180.

benign lesions from all sources 54, or 10 per cent, have been incorrectly treated for cancer. The rule should be that when in doubt, the breast lesion should be treated as malignant. I am confident that when this is done the fatal mistake of an incomplete operation for cancer will rarely, if ever, be made. But the complete operation for a benign lesion will take place in most experienced surgeons' hands in at the most 10 per cent of the benign cases.

It is interesting to note that among these 54 benign lesions which were treated as malignant, in 27 cases the diagnosis of malignancy was based upon the clinical appearance alone. That is, associated with the benign lesion there were some changes in the nipple or skin which as a rule are the signs of cancer. In 24 cases, the diagnosis of cancer was based on the gross appearance at the exploratory incision; in five cases on the frozen section. It would be natural to ask whether, in these twenty-two cases in which the diagnosis of malignancy was made from the gross appearance, a frozen section would not have aided in the diagnosis. I am inclined to think that it would have left the surgeon still in doubt.

From my experience, conversation and correspondence with surgeons and pathologists throughout the country, I get the impression that the majority do not realize the danger of incomplete operations for cancer of the breast, or from two-stage operations, such as removal of the tumor or the breast, and later, after microscopic diagnosis, the complete operation for cancer. Surgeons and pathologists not knowing the fatality of such a mistake are less chagrined than when they make the other mistake of diagnosing and treating a benign lesion as cancer. With this knowledge, all of us should, when in doubt, treat the breast lesion as malignant and expect as the natural consequence to perform now and then the cancer operation for a benign lesion.

The following exact figures of the possible mistakes in the different types of benign lesions are recorded here for the interest of surgeons and pathologists who are called upon to make this diagnosis.

I shall not discuss this problem further, nor give any illustrations, because the entire subject is about to be published in detail as presented in the Muetter Lecture in Philadelphia last December.

Connective-tissue tumors. Taking for consideration those tumors which arise in the derma (subepidermal), the subcutaneous tissue, the fascia, the sheaths of tendons and nerves and the intermuscular connective tissue, we have 406 distinctly benign cases and 132 sarcomas. The probability, therefore, of malignant disease is about 25 per cent. Many of the sarcomas developed in pre-existing lesions which may be looked upon as benign. In sarcoma of the skin where, on account of its position, the pre-existing lesion is easily visible and palpable, the number of such cases is larger. For example, in 48 sarcomas of the skin the malignant tumors developed in a nævus 8 times, in a scar 20 times, in a fibroma 9 times. There were, therefore, only 11 cases in which the previous presence of a benign lesion could be excluded. In sarcoma of the subcutaneous tissue it is more difficult to demonstrate a pre-existing benign lesion, but the long duration in many cases of the palpable mass before any local growth suggestive of malignancy would indicate this probability.

If these subepidermal and subcutaneous tumors are attacked surgically very quickly after their first appearance, the problem of differential diagnosis between the benign and malignant, although it may be difficult, is, in the great majority of cases, not at all essential for treatment, because these lesions in their beginning can be radically removed by complete local extirpation without danger or mutilation, and it makes little difference what the microscopic section shows, except as to the prognosis. The locally and completely removed sarcoma, when it is not cured, kills by metastasis through the blood-vessels, and no local operation, no matter how extensive, will influence this result.

In a few instances, on account of the position and extent of the local growth, the differential diagnosis between a benign and malignant lesion may be necessary to save the patient from a more extensive local operation which would be indicated for sarcoma and unnecessary for a benign lesion. In our experience this rarely happens. In 406 dis-

tinctly benign lesions the operation was performed on the diagnosis of sarcoma in 82 cases, but in only 5 cases did this more extensive eradication unnecessarily mutilate. In these five cases an amputation was done. On the other hand, a correct surgical diagnosis from the clinical history and gross appearance saved patients from the mutilation of amputation 8 times. Correct diagnosis, therefore, in 406 cases would have saved mutilation in 13 instances.

The microscopic differentiation between certain types of benign connective-tissue lesions and sarcoma is so difficult, especially in those types of sarcoma in which the probability of a cure after complete local eradication is so large, that in my opinion, based upon this investigation of 538 cases, I should always incline to the diagnosis of malignancy when in doubt. In the vast majority of cases such a more extensive operation will not increase the risk or the mutilation.

On the other hand, it is much simpler, except for the angioma, to completely excise all benign connective-tissue tumors, and in my experience, enucleation should never be done. With few exceptions these benign connective-tissue tumors can be radically excised by cutting through healthy tissue beyond the new growth just as one should do in sarcoma, and thus treat the case as a sarcoma. After such an operation the most expert cellular diagnosis will cause the surgeon no anxiety.

There are, however, a few cases in which a differential diagnosis is essential to save mutilation, but fortunately in these few cases the infiltrating character of the local growth is such that if it is sarcoma little could be expected as to a permanent cure from removal, no matter how complete, while for the benign lesion such a mutilating operation would be unnecessary.

This is true in certain types of intermuscular hæmangioma and in fibrohæmangioma; in myositis where the absence of bone formation makes the identification of the benign lesion more difficult. It is also true in some extensive fibrospindle-cell-tissue formations in scars and in the desmoid tumors of the abdominal wall. In all the cases in which I had an opportunity for investigation the sarcomas, which might simulate these benign lesions were hopeless, while the benign lesions when recognized have been cured by less mutilating operations.

In differentiating this more difficult group surgeons are aided by an accumulated experience of the results of operations for the different lesions in the different localizations.

In tumors of the tendon sheaths, of the abdominal wall, especially of the recti, in scars, and in fibromas, we see cellular pictures resembling very closely periosteal sarcoma of bone. In the former lesions we rarely fail to cure, in the latter the reverse.

I am unable to find in the literature a comprehensive investigation of connective-tissue tumors, benign and malignant.

That I have called these 406 cases benign is, of course, no absolute proof of their benignity, because in the majority of cases the local operation was sufficiently radical to have cured some types of sarcoma. The ultimate results, however, in these 406 cases show no deaths from malignancy, even in a smaller group in which the lesion was not radically, or even completely, removed. There have been recurrences in a few, especially the angiomas and in scar-tissue tumors, but in these cases secondary operations have accomplished cures.

On the other hand, the ultimate results in 132 cases of sarcoma confirm the diagnosis in the majority, but among those cases which have remained well one might question the diagnosis of sarcoma.

In sarcoma of the skin there are 14 cases of round-cell angiosarcoma of the perithelial type and but one cure, while among 20 sarcomas in scar tissue we are certain of 8 cures, and 7 deaths from sarcoma. In how many of the 8 cases was the lesion really a sarcoma? The same question might be asked in 9 cases of sarcoma of the skin which developed in fibromas. We know that six are cured, three were not. Among the two cases of multiple sarcoma of the skin and three of mycosis fungoides there is not a single cure. The cures, therefore, in sarcoma of the skin, with one exception, are in a type of sarcoma most difficult to differentiate from fibroma or keloid. What the results would have been in

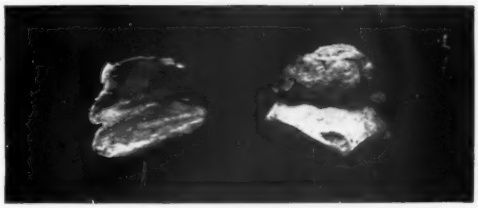


Fig. 1. Path. No. 13360. Hæmangioma, skin of finger. Age 15, tumor 3 months. Ulceration following trauma 3 weeks. Excision with Paquelin cautery to base. No recurrence. See Fig. 2 for photomicrograph.

these 48 cases of sarcoma of the skin, had the patients sought advice early, is difficult to state. In only six cases the lesion had been present less than one year. Three of these cases have been cured. The type of the sarcoma in three cases that have not been cured was the most malignant — perithelial angioscarcoma. In the remaining cases the lesion had been present one or more years, and we naturally ask the question, Would not the number of cures have been increased by earlier intervention, especially among the sarcomas in scars, fibromas, and nævi? In all of these cases at the onset radical operations could have been done without mutilation. The

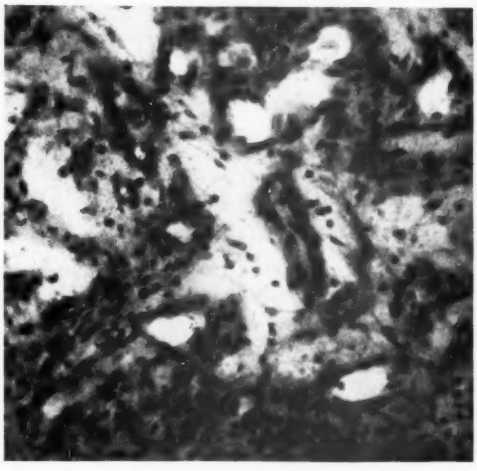


Fig. 2. Path. No. 13360. Photomicrograph of Fig. 1. Ulcerated subepidermal hæmangioma of finger. This section would exclude sarcoma. The patient was sent into the clinic with diagnosis of sarcoma for amputation of the finger.

Fig. 3. Path. No. 12450. Hæmangioma, subepidermal and subcutaneous. White male, aged 24; skin nævi and subcutaneous compressible nodules for years; rapid growth following trauma 3 weeks. Tumor infiltrating. Sent to St. Agnes clinic with diagnosis of sarcoma for amputation. Compressibility and change in size exclude sarcoma. Complete excision. Microscopic section shows hæmangioma and lymphangioma. No recurrence; good function of arm.

hope to cure a sarcoma of the skin of the more malignant type, not developed in pre-existing lesions, must depend upon the education of the public, physician and surgeon to the necessity of immediate local and complete extirpation. For example, in four cases of perithelial angiosarcoma the little lesion was

Fig. 4. Path. No. 7531. Hæmangioma, back of hand. Tissue sent from dispensary with diagnosis of sarcoma. The tumor had ulcerated after trauma, similar to Fig. 1. The section shows a hæmangioma; very cellular, due to perithelial and endothelial proliferation. Piece of epidermis shown in section.

Fig. 5. Path. No. 13188. Congenital hæmangioma of face. Male aged 58; at birth tumor size of ten-cent piece below eye; gradual growth; fifteen years ago unsuccessful treatment with Paquelin. Photograph shows condition before treatment at age 58.

present in the scalp and could not be differentiated clinically from an ordinary wen. These tumors were operated on from six weeks to two years after onset. None were cured. Most surgeons look upon the appearance of the scalp tumor, clinically like a wen, as an

Fig. 6. Path. No. 1620. Fibrohæmangioma about ankle-joint. Male aged 46, tumor 24 years; first compressible with variation in size, now hard and nodular. Sketch of condition about ankle. See Figs. 7, 8, and 9 for gross and microscopic pictures. Clinical diagnosis sarcoma; partial excision, because amputation refused. Patient well over sixteen years after operation.

Fig. 7. Path. No. 1620. Sketch of the tumor masses exposed at operation by Harvey Cushing. See Fig. 6.

innocent lesion, but our experience shows that there is a possibility of the most malignant type of sarcoma. Therefore all such tumors should be completely excised at once. The most radical extirpation here is not mutilating. The danger of the delay is not in a local recurrence, but in metastasis.

Hæmangioma. We have for study 132 cases of benign hæmangiomas, which have been subdivided as follows: Hæmangioma of the skin or subcutaneous tissue. 95 cases; incorrect diagnosis, 9 cases. But in these cases the complete local excision on the diagnosis of sarcoma did no harm. In four cases in which the ulcerating tumor was situated in the neck of young children, the correct diagnosis saved

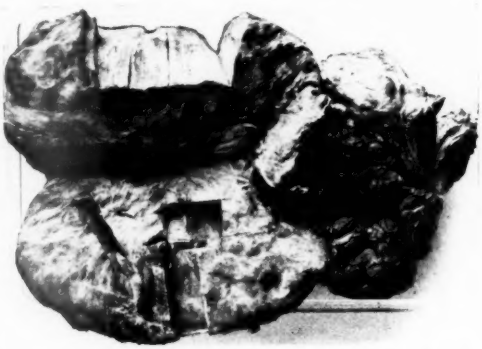


Fig. 8. Path. No. 1620. Photograph of alcohol specimen in case illustrated in Fig. 6. Note the white areas and the dark brown spongy areas. From the spongy areas blood could be expressed in the fresh specimen.

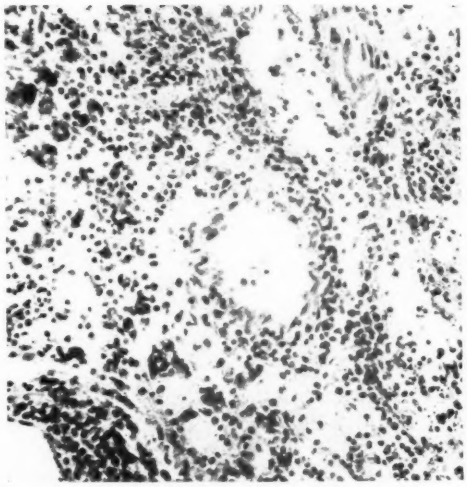


Fig. 9. Path. No. 1620. Photomicrograph of case shown in Fig. 6. Fibrohæmangioma. High power of fibrous area. Note cavity lined by endothelial cells.

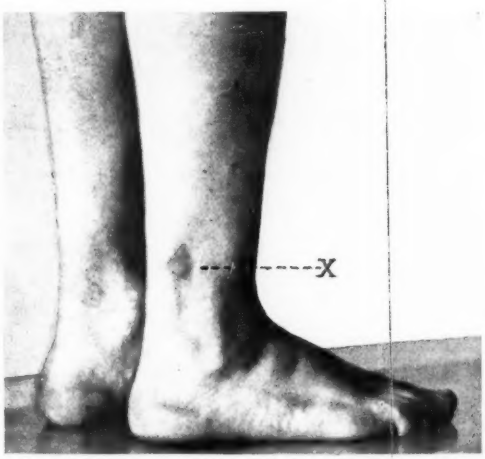


Fig. 10. Path. No. 13172. Intermuscular hæmangioma. Photograph to illustrate compressible swelling of leg at X. Male, aged 20; pain in leg eight years; compressible lumps seven years, becoming larger when patient is standing. At operation, masses of varicose veins, subcutaneous and intermuscular, red, spongy vascular tissue. Partial excision, Paquelin. No recurrence one year since operation. Good function.

these patients from more dangerous and mutilating operations.

The hæmangiomas are most frequently congenital tumors. They are usually situated subepidermally. In this situation they can be recognized by their color as well as by their compressibility. In the subcutaneous tumor we have only the compressibility and changes in the size of the tumor to indicate the diagnosis. The ulceration of the congenital or acquired subepidermal hæmangioma is not a sign of malignancy. The epithelial covering of the angiomatous tissue is so thin that it is easily destroyed by a trauma, irritation, or even local growth of the tumor (Figs. 1 and 2). Ulceration of the subcutaneous tumor in my experience has always been a sign of malignancy, unless there has been a severe trauma, or an exploratory operation.

Acquired angioma may be both subepidermal and subcutaneous (Fig. 3). These tumors are often extensive and follow the course of the superficial veins. In the case illustrated in Fig. 3 one could be quite certain that if it were sarcoma the chances of a cure, even by amputation, would be nil. A sarcoma of this size and infiltrating character would have given metastasis. This case was treated on the diagnosis of an angioma, and the ultimate result confirmed the diagnosis.

The microscopic diagnosis of the benign angioma is readily made when we find numer-

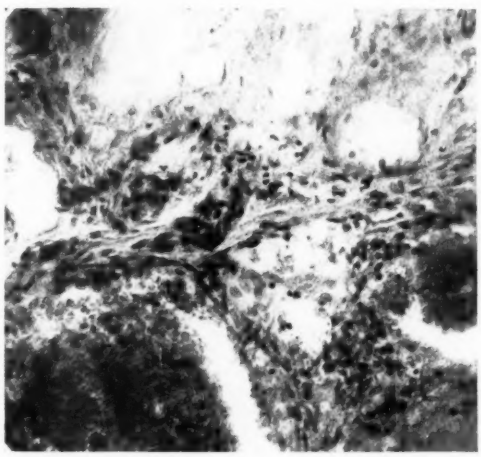


Fig. 11. Path. No. 13172. Photomicrograph of intermuscular hæmangioma in case illustrated in Fig. 10. Note the marked endothelial proliferation in some of the blood spaces.

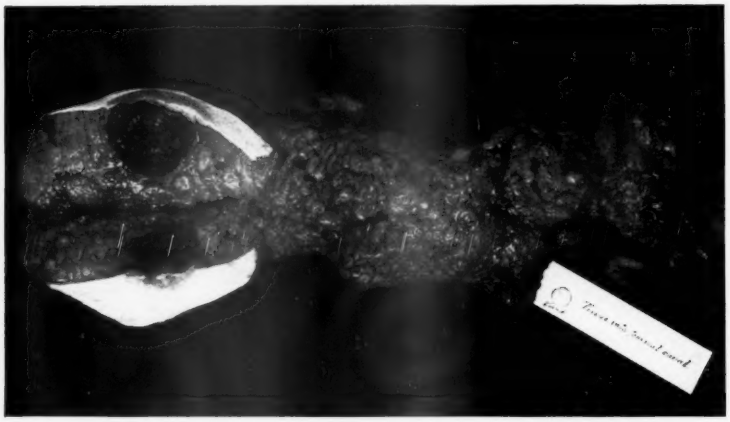


Fig. 12. Path. No. 9063. Sarcoma (?) in congenital nævus. White female, aged 67; small nævus on inner aspect of thigh; growth slow for three years; rapid past six months. Exploratory incision three weeks. The photograph illustrates tumor and subcutaneous tissue removed from thigh and groin. No metastasis to glands. Well five years since operation. See Fig. 13 for microscopic picture.

ous blood spaces lined by endothelial cells (Fig. 4). In sarcoma these blood spaces may be present, but they are very few in numbers. In some hæmangiomas the blood spaces are so small and are so often filled with proliferating endothelium that a diagnosis of a malignant endothelioma might be made. In other cases about the small endothelium-lined blood spaces the stroma of the angioma is filled with round cells and a differential diagnosis from a perithelial angiosarcoma might become difficult. This is especially true when ulceration has taken place. In my own individual experience there has never been any particular difficulty in diagnosis when this differential diagnosis was really necessary, because in all doubtful cases the complete eradication has so far been possible, and in a few, when this would have been dangerous or mutilating, we have been able to make the diagnosis from a combination of the clinical, gross, and microscopic features. In my experience, in benign angiomas there always remains some spongy tissue from which blood can be expressed. I have not seen this in sarcoma. This gross appearance has been more helpful than the microscopic picture.

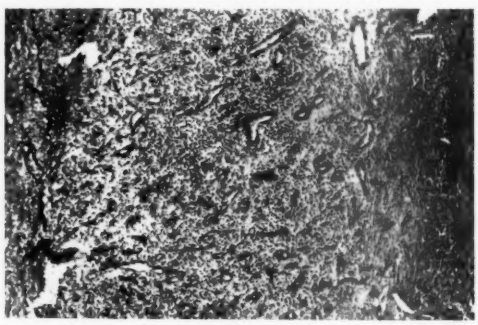


Fig. 13. Path. No. 9063.[1] Sarcoma (?) in congenital nævus (see Fig. 12). Low power. Very cellular tumor, but endothelial spaces of capillary angioma preserved.

The danger of a sarcoma developing in a hæmangioma is relatively small, but the possibility must always be considered. We have at least 36 cases of sarcoma in which the type suggests its development from an angioma. In some the angiomatous tissue may have been the result of granulation tissue after trauma, and not developed from a pre-existing angioma. In 12 sarcomas of the skin of the perithelial-angiomatous type there is no doubt that in 6 cases the sarcoma developed in a congenital nævus.

Neglect to immediately remove or eradicate with carbon dioxide snow has another danger besides the possibility of a malignant change,

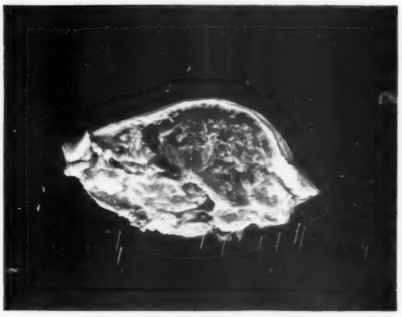


Fig. 14. Path. No. 13280. Sarcoma (?) of skin in fibroangioma. Photograph of section through recurrent tumor. The dark areas are due to blood pigment. White female, age 79; blood blister on heel three years; tumor two years; removed two years ago; recurrence six months ago; complete excision of tumor and scar. (See Figs. 15 and 16.)

and that is a huge local growth which itself is mutilating, and operation for a cure in this stage difficult, often dangerous, tedious and always mutilating (Fig. 5.)

Fibroangioma. Fifteen cases: 5 incorrect diagnoses of sarcoma, which, however, did not lead to mutilating operations, because in two in which amputation would have been indicated on such a diagnosis the patients refused this operation and submitted only to a local extirpation which in both instances was incomplete. Yet both these patients are well seventeen and twelve years after operation.

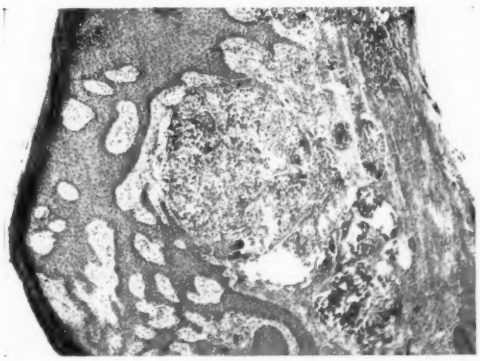


Fig. 15. Path. No. 13280. Photomicrograph, low power, through tumor shown in Fig. 14. Benign hypertrophy of epidermis; pigmented, vascular, cellular growth beneath, with spaces of various sizes lined by proliferating endothelial cells.

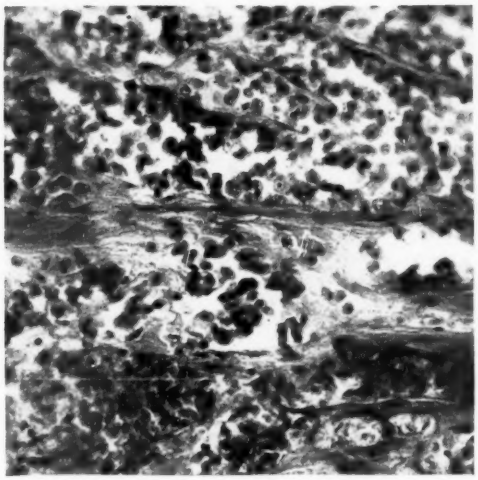


Fig. 16. Path. No. 13280. High-power photomicrograph shown in Fig. 15. Alveoli of endothelial cells with and without pigment in fibrous stroma.

These two cases must prove that the diagnosis of a benign lesion is correct, because gross and microscopic, there is no difference between the tumors completely eradicated in 13 instances, and these two incompletely removed.

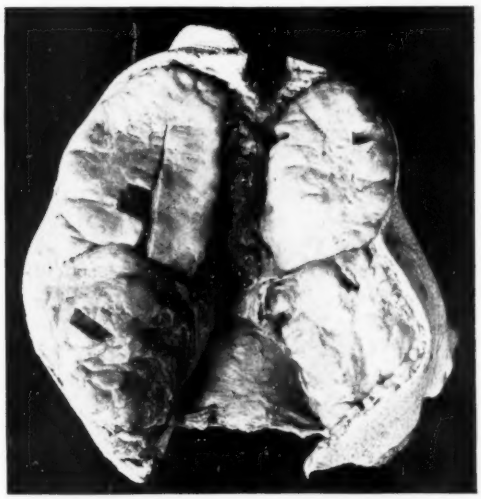


Fig. 17. Path. No. 13728. Sarcoma in fibroma, recurrent after enucleation. Photograph of specimen removed. The specimen has been cut and shows skin, tumor, and underlying muscle.

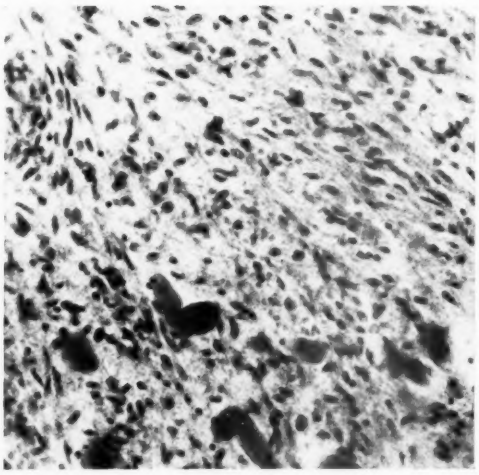


Fig. 18. Path. No. 13728. Fibro-spindle-cell sarcoma in fibroma. See Fig. 17 for gross appearance. This represents a very cellular area infiltrating muscle.

Fibroangioma is apparently the result of an inflammatory reaction in a hæmangioma. This reaction is either due to trauma or interference with the circulation. The increasing tumor, originally compressible and showing changes in size, becomes harder, the compressibility disappears, the change in size is not observed. If it is situated near the skin the thin epidermis may ulcerate. In gross appearance we see two distinct types of tissue: red, spongy, vascular areas resembling capillary angioma, and firm, white areas more like fibrospindle-cell sarcoma than fibroma. Even in the gross, pigmented areas may be seen. Under the microscope in the vascular, red areas, we see the picture of angioma. Frequently the blood spaces are plugged with endothelial cells giving the picture of an endothelioma. The white areas are cellular with varying amounts of eosin-staining fibrous tissue, and we see numerous areas of endothelial cells in nests in this cellular connective tissue. Blood pigment from old hæmorrhage is observed in the cells of different types and in the stroma. From a histological study these tumors are difficult to differentiate from sarcoma. The importance of the differential diagnosis is present only when complete eradication would be mutilating. In 13 of the 15 cases, complete excision was possible without danger or mutilation. In three of these cases the operative diagnosis was sarcoma. All of these patients have remained well since operation. In one case (Fig. 6) the tumor was present about the ankle-joint, but the patient refused amputation. Tumor tissue was left attached to the tendon sheath. This patient is well (June, 1913), sixteen and one-half years since operation. Fig. 6 is a sketch of the clinical appearance, Fig. 7 a sketch of the operative findings, Fig. 8 a photograph of the gross specimen, and Fig. 9 shows the microscopic appearance. In the second case the tumor was situated in the muscle of the thenar eminence of the right thumb. The partially removed tissue was sent to the laboratory with the diagnosis: sarcoma, tumor incompletely removed, patient refused amputation. This patient is well (June, 1913), almost twelve years since operation.

Intermuscular angioma. Nine cases: 4 incorrectly diagnosed and one of these subjected to an unnecessary amputation of the thigh.

Intermuscular hæmangiomas should not be difficult to recognize. They appear as diffuse

Fig. 19. Path. No. 7432. Sarcoma (?) in skin scar. Photograph of patient. White female, aged 36; chronic acne and blackheads many years; induration eighteen months; tumor nine months. Incomplete excision. No recurrence six and one-half years.

compressible swellings, often visible externally (Fig. 10). The swelling shows variation in size when the limb is lowered or raised, or when constrictions are made on the veins above. Often the superficial veins are dilated. In some instances diffuse lipoma and multiple tuberculosis of the tendon sheaths may give a somewhat similar clinical picture. At the exploratory incision numerous dilated veins are encountered, and in and between the muscles one sees red, spongy, angiomatous tissue.

Microscopically (Fig. 11), we may find every type of an angioma from a capillary to cavernous. The amount of stroma varies; endothelial proliferation in the blood spaces is very common. This tumor may be situated anywhere. We have observed it three times near the masseter of the cheek, twice on the forearm, twice in the muscles of the calf of the leg, and twice in the thigh. With this experience one might feel quite certain that the differential diagnosis from an intermuscular sarcoma is not difficult. Complete removal for the intermuscular hæmangioma is not necessary and need never be performed if such a procedure would be mutilating. The scar tissue of the partial excision and in some cases the employment of the cautery will destroy the vascular tissue with little or no injury to muscle function.

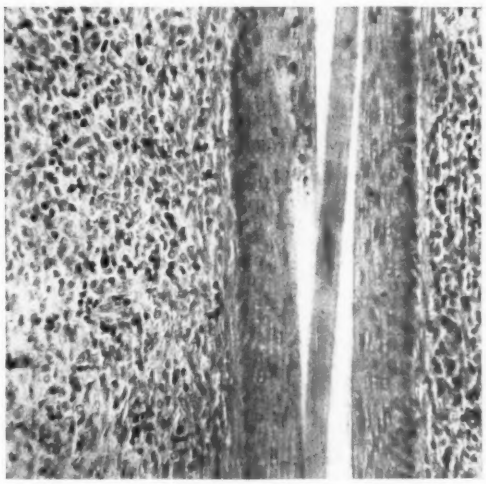


Fig. 20. Path. No. 7432. High-power photomicrograph from case illustrated in Fig. 19. Although this cellular tissue looks like sarcoma, the hair follicle is uninjured. I have never observed this in sarcoma.

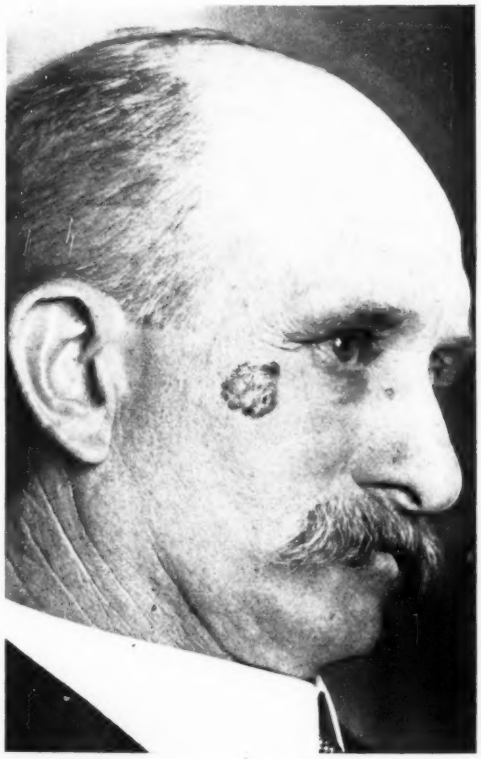


Fig. 21. Path. No. 14056. Pigmented fibroma of the skin after injury with piece of coal. Complete local excision. This area was similar to the one in which the sarcoma illustrated in Fig. 22 developed.

Granulation-tissue tumors. Thirteen cases. Pieces of six of these tumors were sent to the laboratory diagnosed sarcomas, and these patients were saved unnecessary and mutilating operations. These granulation-tissue tumors occur on the skin, and are either due to the ulceration of a pre-existing hæmangioma, or to exuberant granulation tissue in a superficial wound. A tumor of this kind presents a small fungus covered with granulation tissue, not unlike an ulcerating sarcoma (Figs. 1 and 2). In my experience the local growth is never as great as in the sarcoma. Microscopically, this tumor is very

Fig. 22. Path. No. 2886. Round-cell sarcoma, in skin scar. Male, aged 34; pigmented scar four years after trauma from lump of coal; two years later growth in scar; six months ago incomplete excision; immediate recurrence. The photograph shows the recurrent growth on forehead. This patient died in one year of internal metastases; no local recurrence. See Figs. 23 and 24 for gross appearance of the recurrent tumor excised.

cellular, but the endothelium-lined blood spaces (Fig. 4) are always more numerous than in sarcoma, and the stroma is of the type of granulation tissue.

Angiosarcoma. In six cases of sarcoma of the skin arising in congenital nævi there has been one cure. In five instances the tumor, when it came under observation, was a fungus and inoperable from local growth or metastasis. In the history of all of these cases there had first been a local growth in a nævus quiescent for many years, from four to seventy-four years. The character of this local growth was sufficient to indicate immediate radical excision. The ulceration took

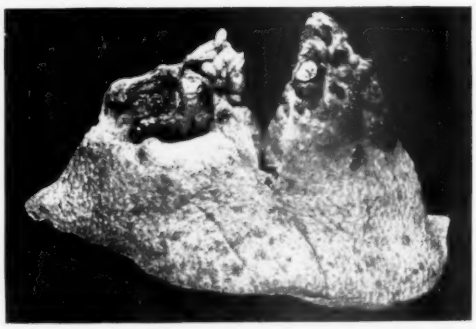


Fig. 23. Path. No. 2886. Surface of recurrent tumor excised from patient shown in Fig. 22. Note peculiar ulceration.

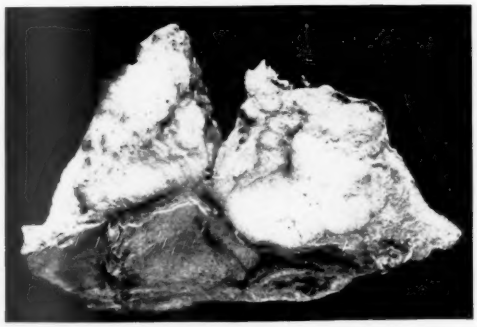


Fig. 24. Path. No. 2886. Cross section through tumor shown in Fig. 23.

place at varying periods after the onset of growth, from a few months to three years. It is impossible to say, of course, what these tumors looked like in the onset. When they came under observation they were very cellular, friable, vascular neoplasms resembling hæmorrhagic brain tissue, microscopically, round-cell sarcoma of the perithelial type. In the one case cured by radical excision the tumor situated in the skin of the thigh was the smallest observed. The local growth had been present about six months (Fig. 12). Histologically, this tumor suggests that it might still be an angioma, and not an angiosarcoma (Fig. 13). Endothelial blood spaces are still preserved, but the tissue between them is very cellular and resembles sarcoma more than granulation tissue. This patient has remained well five years since operation.

It is my opinion that we should be able to recognize the development of a sarcoma in a congenital nævus and cure the majority of cases by immediate radical excision.

In nine cases of sarcoma of the skin resembling the previous cases clinically and pathologically there has been one cure. The duration of the nodule has varied from six weeks to seven years in patients whose ages varied from four years to seventy. Three had been present on the scalp and were clinically like an ordinary wen, one as a blood cyst of the cheek, one in the neck, two on the eyelid, one in the skin above the pubes, one near the ankle. In all of these cases there had been a definite trauma, and in some, recurrent irritation.

The cured case began in a varicose vein near the external malleolus; it recurred after the first excision, and has now remained well two years after the removal of the recurrent nodule. Fig. 14 illustrates a section through the small recurrent tumor. It resembles somewhat the fibroangioma. Figs. 15 and 16 are from a section of the recurrent tumor. Histologically, it suggests an endothelioma; the pigment is due to hæmorrhage. It is quite natural to ask, Is this an angiosarcoma or a fibroangioma?[1]

Among the 22 cases of angiosarcoma there is not a single cure. In 11 cases the lesion had been present years or longer, in 11 cases months. Trauma is the most common etiological factor, suggesting the possibility of the development of a sarcoma in the granulation tissue secondary to trauma, or the effect of injury on a pre-existing angioma.

In none of these tumors was there any difficulty in making a diagnosis from the clinical appearance or the gross and microscopic pathology when they first came under our observation.

The differential diagnosis in this group, if seen or explored early, would have to consider and exclude tubercular myositis, syphilitic gumma, non-ossifying myositis, intermuscular angioma and fibromyxoma of nerve sheaths. I am unable to present exact methods based upon experience, because none of these lesions have presented themselves clinically in the early stage. The Wassermann reaction and therapeutic effect of salvarsan have so far in my experience allowed us to make the correct diagnosis in gumma. Tubercular myositis has always come under observation in the abscess stage. After a contusion to the soft parts, if the resultant swelling does not disappear rapidly and the X-ray shows no ossifying myositis, the lesion should always be explored. Only in this way will we get in the early and possible curable stage sarcoma secondary to trauma. The first appearance of a subcutaneous mass, whether it be circumscribed or diffuse, should demand immediate investigation. In the absence of a positive Wassermann it should be explored. Only in this way will we be able to treat sarcoma in the earlier stage. It must be remembered, however, there may be great danger in these early explorations, if the surgeon is not qualified to make the differential diagnosis. The larger number of cases are benign. Especially is this true of traumatic myositis and organizing hæmatoma. Here operations on the diagnosis of sarcoma would be mutilating and unnecessary.

Fibroma. I have records of 34 cases of fibroma of the skin and subcutaneous tissue, 13 desmoids or fibromas of the abdominal wall, 20 tendon-sheath tumors, and 49 scar-tissue tumors, or keloids — 116 tumors, therefore, of the benign type. During the same time we have observed the following cases diagnosed sarcoma: 20 cases in scars, 9 in fibroma, and 8 fibrospindle-cell tumors situated subcutaneously — in all, therefore, 37 sarcomas. The more I study the cellular pathology of fibroma and fibrosarcoma, the less do I feel able to recognize the border-line lesion. Fortunately, it makes little difference, except in a few cases. These tumors, as a rule, are circumscribed and can be completely and radically removed. If this is done, the majority are cured.

These tumors should never be removed by enucleation. Fig. 17 illustrates a recurrent sarcoma situated in the skin over the shoulder blade. When it first appeared it was the size of a pea. After it had been present some months and had reached the size of an egg it was enucleated under cocaine. The tumor promptly recurred. Four months later when I saw the patient, the recurrent tumor was the size of two fists (Fig. 25). It was now removed with a wide zone of skin, fascia and muscle, and the area skin-grafted. The microscopic appearance of the tumor (Fig. 18) is so cellular that I think we are perhaps justified in calling it a fibrospindle-cell sarcoma.

Keloids. The ordinary benign keloid should not be difficult to recognize. These tumors often recur after complete excision. Yet I have never observed a sarcoma to develop in a true keloid. If the keloid is subject to trauma it may ulcerate.

In other cases the tumor developing in scar

[1]December, 1913. There is now a local recurrence in the scar, but no signs of metastasis. Duration of disease now four and one-half years, rather long for sarcoma.

tissue may be very difficult to distinguish from sarcoma. Fig. 19 represents a tumor of the back developing after a long history of acne and blackhead formations. The area was excised eight years ago. The microscopic pathology (Fig. 20) demonstrates that the neoplasm is composed of a cellular tissue about hair follicles. This microscopic change was present up to the border of the tissue excised. Nevertheless, there has been no recurrence. Many pathologists who have examined this section for me are of the opinion that it is a sarcoma. If it is, it is one that may be cured by incomplete removal.

Clinically, I was of the opinion that this case was a carcinoma developing in hair follicles or glands of the skin, secondary to chronic irritation of the acne. I removed the zone shown with a wide margin, but when I studied the edges and found the cellular tissue present beneath the epidermis, I felt that it was sarcoma. Metastasis must have taken place, and there was no indication to remove more than one-fourth of the skin of the back. After careful investigation I concluded that it must be an inflammatory tumor. The result has confirmed this.

There is no doubt that the most malignant sarcoma may develop in scars of different types. Fortunately I have observed examples of the beginning and the end of such lesions. Fig. 21 illustrates an area on the face secondary to an injury with a piece of coal. It was pigmented, raised. Microscopically, it shows cellular granulation tissue and coal pigment. It was removed a few months after the injury, and there has been no recurrence.

Fig. 22 pictures a man who had a similar area after an injury with a piece of coal on the forehead. Some years later when it increased in size, it was incompletely removed on the diagnosis of keloid. The picture illustrates the recurrent tumor, which was radically removed (Figs. 23 and 24). It proved to be a round-cell sarcoma. The coal pigment was still present. The patient died of internal metastasis.

THE POST-OPERATIVE RESULTS OF TRACHELORRHAPHY IN COMPARISON WITH THOSE OF AMPUTATION OF THE CERVIX [1]

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IN the year 1862, it happened that Sims, on leaving the country for a visit to certain European clinics, referred to his associate, T. A. Emmet, a patient who had suffered for years with an "ulcerated cervix" and had become a confirmed invalid. After treating the case for some time by the usual methods and with the usual disappointing results, Emmet (1), one day while examining her, more or less by accident discovered her real condition to be a bilateral laceration of the cervix, and immediately devised an operation to restore the cervix to its normal outline. Speaking of this discovery, some twenty years later, Wells (2) says: "Though for more than two centuries the thinking minds in the profession had recognized, more or less clearly, the dependence of the then called 'ulcerations' upon previous laceration of the cervix, no one seems to have realized fully the feasibility of curing the lesion by closing the laceration, and the honor of inaugurating a new era in the treatment of these fissures was reserved for the clear seeing genius of Emmet, who recognized and showed, as had no one before, the real nature and importance of this frequent 'ulceration' of the parous cervix."

On November 27, 1862, Emmet first performed the operation of trachelorrhaphy on Sims' patient, with what proved to be brilliant results. It was not, however, until eight years later, when he had repeated the operation some two hundred times, that Emmet reported the technique of his procedure and the gratifying results obtained. In a paper read before the Medical Society of the County of New York on September 28, 1874, Emmet describes his first case in these words: "While making a digital examination one day, I was puzzled to account for the greater width of the cervix in comparison to that of the body beyond, a condition I had for the first time appreciated. I placed her on the left side, and with a Sims speculum brought the cervix in view. I drew the posterior lip forward towards me, with no special purpose, when I was surprised to observe that it had decreased to nearly half its previous size. On lifting up the anterior lip with a tenaculum in the other hand, so as to bring the two portions in approximation, the outline of a cervix presented of nearly a normal size. The difficulty was at once apparent, for the parts had rolled back within the uterine canal, and a deep lateral fissure became evident, which extended on each side entirely through the cervix and beyond the vaginal junction. On separating the flaps and forcing them back to their former position, I saw the tissues gradually roll out, and the cervix again present its previous appearance. The remedy at once suggested itself." In discussing Emmet's paper at this meeting, Sims (3) paid high tribute to his work with the statement: "We can't modify the operation. We can't change it, for it is perfect—perfect in its method, and perfect in its results." As much due to the support of such men as Sims, Thomas, Fordyce Barker and Goodell as to the really great importance of Emmet's discovery, the operation almost immediately gained widespread use throughout America and England and before many years was practiced to some extent in Germany and France. In the latter countries, however, it has never won the recognition and use it has so well merited.

In the April (1913) issue of this journal, the writer reported an analysis of the post-operative results of the cases of amputation of the cervix performed in the Gynecological Clinic of the Johns Hopkins Hospital during the past twenty years, a complete post-operative history having been obtained in 128 of the 400 cases recorded in the protocols of the department. The conclusions reached by an analysis of these cases were quite unexpected, and, in many ways, disappointing.

[1] From the Gynecological Clinic of the Johns Hopkins Hospital.

Although the results obtained regarding the improvement in the general health and the cure or amelioration of leucorrhœa showed the operation to be highly efficient in these respects, the more important facts brought out by the analysis were in connection with the marital histories of these cases, following operation. Of those women, in whom the occurrence of a pregnancy might naturally have been expected, four-fifths remained sterile. On the other hand, over 50 per cent of the pregnancies occurring after operation ended by miscarriage or premature delivery, while of the few remaining which progressed to full term, even a larger percentage experienced prolonged and difficult labors. The cases reported had all had a circular amputation of the cervix, on an average of about three centimeters of the cervix above the external os being removed, and on learning of the results obtained, Dr. W. W. Russell at once suggested that the cases in which the cervix had been repaired by Emmet's method be followed up in order to afford a suitable basis upon which the two operations might be compared as to their therapeutic efficiency and their effects upon the subsequent marital history. Accordingly, a circular letter was sent to all the cases of trachelorrhaphy performed in this clinic during the past ten years. The number of complete reports received, although disappointingly small, is large enough to furnish a fair comparison of the remote results of the two procedures.

POST-OPERATIVE HÆMORRHAGE

The danger of serious hæmorrhage after amputation of the cervix has been shown to be very real. The occurrence of a discomforting "ooze" after this operation, requiring the use of tight vaginal packs, is only too familiar. On the other hand, alarming hæmorrhage is by no means uncommon. Of 128 cases in this clinic, 6, or nearly 5 per cent, bled so profusely at some time during the convalescence as to necessitate their removal to the operating room for resuture of the cervix. In each of these cases tight vaginal packs had failed to control the hæmorrhage.

Similar experiences were not unknown to the earlier operators after the performance of trachelorrhaphy, although such cases were very infrequent. Thus, Goodell (4) reports but three instances of post-operative hæmorrhage in over 200 cases of trachelorrhaphy, in which it became necessary to resuture the cervix on this account, while Emmet reports the same number as occurring among some 600 cases. Severe post-operative hæmorrhage in cases of trachelorrhaphy has been very unusual in this clinic and resuture of the cervix on this account has never been found necessary, although in two of the cases reported herewith slight hæmorrhage occurred, necessitating the use of vaginal packs.

In reporting the 6 cases from this clinic in which hæmorrhage occurred after amputation of the cervix, it was pointed out that an added danger from this complication was that it might arise at any time during the convalescence, and even weeks after operation, when the patient had passed from the surgeon's observation. Similar cases of late post-operative hæmorrhage have been reported as following trachelorrhaphy, Wells (2), particularly, having given warning of this danger in reporting several cases in which the hæmorrhage occurred many days after operation.

In 2 cases of the series reported, hæmorrhage occurred of sufficient moment to require packing the vagina. In one case, the bleeding began on the sixth day, and in the other on the seventh. The hæmorrhage was easily controlled in both cases. When we consider that after amputation of the cervix, serious post-operative hæmorrhage occurred in nearly 5 per cent of the cases, it would seem that the comparative freedom from this danger after trachelorrhaphy justifies, in itself, the choice of the latter operation whenever indicated.

INFLUENCE OF AMPUTATION AND REPAIR OF THE CERVIX ON THE GENERAL HEALTH

A lacerated cervix is more often than not the seat of a chronic infection. That the removal of such a focus of chronic infection should be followed, in a large percentage of cases, by a marked improvement in the patient's general condition is, therefore, not surprising. After amputation of the cervix 91 per cent of 128 cases noticed such improvement. In 13 of these cases, amputation of

the cervix was the only operation performed, yet 12 of these, or 92 per cent, reported improvement in the general condition. After trachelorrhaphy, 34 out of 39 cases, or slightly over 87 per cent, reported noticeable improvement in the general health, a result which compares very favorably with the amputation cases. It should be noted, however, that in this clinic trachelorrhaphy has only been chosen as the method of procedure in those cases presenting one or two more or less discrete lacerations and without a marked endocervicitis. A cervix badly infected or one showing multiple lacerations has almost invariably been amputated. For this reason the results of the two operations can not be quite fairly contrasted in their effects upon the general health. The fact remains, however, that after each operation about 90 per cent of the patients are improved in general condition. The effect of other operations, simultaneously performed, must of course be taken into consideration in determining to what extent this improvement is due to the plastic operation on the cervix.

INFLUENCE OF AMPUTATION OF THE CERVIX AND TRACHELORRHAPHY ON THE GENERAL HEALTH

	No. Cases	No. Cases Improved	No. Cases Same	No. Cases Worse
Amputation of cervix alone or with perineorrhaphy	80	72 (91%)	6	2
Trachelorrhaphy alone or with perineorrhaphy	25	22 (88%)	3	0
Amputation of cervix followed by abdominal section	48	43 (90%)	2	3
Trachelorrhaphy followed by abdominal section	14	12 (86%)	2	0

The table brings out one fact very clearly: the improvement in the general condition following either operation is not entirely dependent upon the abdominal operation performed (in most cases a suspension of the uterus and appendectomy). In each group it will be noted that the percentage of cases reporting improvement is about the same. Inasmuch as the plastic operation on the cervix was the only one common to all these cases, the indication is that its share in producing these results must be, at least, a very important one. In 3 cases, trachelorrhaphy was the only operation performed and each of these report decided improvement in the general condition. In 12 out of 13 cases in which amputation of the cervix was the only operation performed, the same result was obtained. Of the 39 cases of trachelorrhaphy, 5 reported no improvement in the general health. Two of these cases were operated upon recently while in 2 of the 3 remaining cases a very small laceration was resected, the operation being quite atypical. A consideration of the foregoing seems to justify the assertion that in properly selected cases trachelorrhaphy improves the general condition of the patient quite as markedly as amputation of the cervix.

LEUCORRHŒA

Leucorrhœa is the most common and frequently the most distressing symptom of cervical disease. Of the 167 patients requiring either amputation or repair of an infected or lacerated cervix, 85 per cent complained of a vaginal discharge varying in severity from the slight but constant non-irritant leucorrhœa to the profuse, foul, irritating discharge so often the result of a badly infected cervix, and in some instances sufficiently severe as to render the patient practically incapacitated. In this latter group, as has been indicated above, the cervix presenting a marked grade of endocervicitis has almost invariably been amputated, the simpler operation of trachelorrhaphy being reserved for cases showing one or two discrete lacerations, with only a low grade endocervicitis. The results obtained in this group of 142 cases, contrasting the efficiency of amputation of the cervix and trachelorrhaphy in combating leucorrhœa of cervical origin, demonstrates the necessity for a thorough consideration of these indications before proceeding with either operation.

INFLUENCE OF AMPUTATION OF CERVIX AND TRACHELORRHAPHY ON LEUCORRHŒA

Leucorrhœa before operation	Amputation Cervix	Trachelorrhaphy
	109 cases	33 cases
Cured	68 cases = 62.5%	14 cases = 42.3%
Improved	33 cases = 30 %	14 cases = 42.3%
No change	8 cases = 7.3%	5 cases = 15.5%
Worse	1 case	0

It will be seen that in over 92 per cent of the cases, the discharge either disappeared entirely (62.5 per cent) or was noticeably diminished in amount (30 per cent) after amputation of the cervix. In these cases the cervix was usually the seat of a chronic endocervicitis of relatively high grade and the leucorrhœa proportionately profuse. Contrast now the results obtained in this respect by trachelorrhaphy, remembering that in this group the endocervicitis present was usually but slight and the leucorrhœa a relatively unimportant symptom. It will be noticed that the percentage of cases cured is much lower (42 per cent as compared with 62 per cent) and that the percentage of cases in which the operation had no effect whatever on the leucorrhœa is more than twice as high. In 5 cases after trachelorrhaphy, the discharge present before operation remained unchanged afterward. In 2 of these cases a very small laceration was resected by an atypical procedure, these 2 cases being among the five who also reported no improvement in the general condition after operation, a rather significant coincidence. In one other case the abdomen was first opened and the left tube and ovary removed for a chronic inflammatory condition probably of gonorrhœal origin. It being found unnecessary to drain, the cervix was then repaired and the perineum restored. Inasmuch as this patient had had an infection severe enough to require a laparotomy, it is probable that a marked endocervicitis also existed at the time of operation, and the cervix should probably have been amputated.

Any operative procedure on the cervix, in the presence of a chronic endocervicitis, tends to enliven such an infection temporarily. The earlier operators and especially Emmet (1), recognizing this fact, laid great stress upon the importance of preliminary treatment calculated to reduce the endocervicitis present, before operating for the laceration. The patients were often subjected to months of douching and local treatment before an operation for the closure of the laceration would be attempted. Van de Warker (5) was the first to dispense with all this troublesome preliminary treatment, believing that the closure of the laceration rendered the infection present more amenable to treatment. That even a latent endocervicitis is made temporarily active by either amputation of the cervix or trachelorrhaphy is well evidenced by the fact that almost without exception the 167 cases reported here left the hospital with a more or less profuse vaginal discharge, which continued for an average of about two months. For this reason it has been customary in this clinic to start warm vaginal douches about the ninth or tenth day after either operation, and on leaving the hospital to advise their daily use as long as the discharge continues. Occasionally this post-operative leucorrhœa will endure for a long time. In 3 cases, after amputation of the cervix the discharge continued for more than two years and then ceased entirely in 2 cases, and underwent marked improvement in the other. Amputation of the cervix is then an excellent means of treating intractible cases of endocervicitis, the results of this procedure as regards this particular consideration being excellent in over 90 per cent of the cases. On the other hand it is difficult to imagine how trachelorrhaphy could have any effect on a chronic endocervicitis other than to render it more amenable to treatment, as indicated by Van de Warker. When we contrast the effect of amputation of the cervix and trachelorrhaphy as to their efficiency regarding the cure of leucorrhœa of cervical origin, at least one important fact is made clear: Although the repair of a lacerated cervix may render a mild grade of endocervicitis more amenable to treatment, trachelorrhaphy can not be considered as having any direct effect upon the infection present, other than to enliven it, and that the presence of a marked endocervicitis should therefore be considered as a contraindication to its employment.

THE EFFECT OF AMPUTATION OF THE CERVIX AND TRACHELORRHAPHY ON DYSMENORRHŒA

It is generally recognized that the occurrence of dysmenorrhœa in multiparæ is rather unusual, yet of 148 cases of laceration of the cervix treated by amputation or trachelorrhaphy in this clinic, only 30 cases, or about 20 per cent, were entirely free from menstrual pain before operation. Many comments as

to the rôle of cervical laceration in the etiology of dysmenorrhœa, "pelvic neuralgia," etc., can be found in the earlier literature, following Emmet's announcement of the importance of this lesion, but no attempt to explain the mechanism of this relationship is made. That some relationship actually exists, however, seems very probable from a consideration of the results obtained in these cases. As when considering the effect of the operation as regards the general condition of the patient, it is necessary, again, to note the influence of any other operation simultaneously performed, in producing a reduction in menstrual pain following operation. Accordingly, the cases have been divided into two groups, the first comprising those cases in which the plastic operation on the cervix was done alone, or in combination with the restoration of a relaxed vaginal outlet, and the second including those cases in which the abdomen was opened. The results are summarized in the following table:

INFLUENCE OF PLASTIC OPERATIONS ON THE LACERATED CERVIX IN THE REDUCTION OF MENSTRUAL PAIN

GROUP I.

A. *Amputation of Cervix Alone, or with Perineorrhaphy*
Dysmenorrhœa before operation.....55 cases
After operation —
Less pain..... 29 cases, or 53%
More pain..... 5 cases, or 9%
No change..... 21 cases, or 38%

B. *Trachelorrhaphy Alone, or with Perineorrhaphy*
Dysmenorrhœa before operation.....15 cases
After operation —
Less pain..... 12 cases, or 80%
More pain..... 1 case, or 7%
No change..... 2 cases, or 13%

GROUP II.

A. *Amputation of Cervix with Laparotomy*
Dysmenorrhœa before operation.....37 cases
After operation —
Less pain..... 25 cases, or 68%
More pain..... 6 cases, or 16%
No change..... 6 cases, or 16%

B. *Trachelorrhaphy with Laparotomy.*
Dysmenorrhœa before operation.....11 cases
After operation —
Less pain..... 7 cases, or 64%
More pain..... 2 cases, or 18%
No change..... 2 cases, or 18%

The following facts are brought out by the above table:

1. Of 148 cases of lacerated cervix, 118, or 80 per cent, had dysmenorrhœa before operation.

2. In 62 per cent of these cases there was noticeable reduction in menstrual pain following operation.

3. Of 70 cases in Group I, 41 cases, or 59 per cent, had less menstrual pain following operation.

4. Of 48 cases in Group II, 32 cases, or 67 per cent had less menstrual pain following operation.

5. Following amputation of the cervix, in 59 per cent of the 92 cases having menstrual pain before operation, the dysmenorrhœa was cured or improved.

6. Following trachelorrhaphy, in 70 per cent of the 19 cases having menstrual pain before operation, the dysmenorrhœa was cured or improved.

In 48 of these cases (Group II) the abdomen was opened. To what extent, then, must this reduction in menstrual pain be ascribed to the abdominal operation, simultaneously performed? The question is answered in part by the table above, and quite fully in combination with the table to follow.

ABDOMINAL OPERATIONS IN GROUP II

	A. Amputation Cervix	B. Trachelorrhaphy
Suspension of uterus and appendectomy	29 cases	8 cases
Removal of one tube and ovary	2 cases	1 case
Ligation of tubes	2 cases	1 case
Herniotomy	.....	1 case
Cholecystostomy	1 case	
Myomectomy	3 cases	

It will be seen that in 37 of the 48 cases a suspension of the uterus and appendectomy were done, which might easily account for the reduction of menstrual pain in these cases. The same may be said of the three instances in which the adenexa on one side were removed for chronic inflammatory disease, and likewise might possibly also apply to the three cases in which a myomectomy was performed. In 43 of the 48 cases in Group II, then, any reduction in menstrual pain following operation could not be justly ascribed to the operation on the cervix. Not so, however, with Group I. Here 59 per cent of the 70

cases noted a reduction in menstrual pain — a result which could only be due to the plastic operation on the cervix. In 8 cases, amputation of the cervix was the only operation performed. Four of these cases noticed marked reduction in menstrual pain after operation while the other four noticed no change. In 3 cases, trachelorrhaphy was the only operation performed. Each of these cases noticed a decided decrease in menstrual pain.

The conclusion seems inevitable, that laceration of the cervix bears some definite relationship to dysmenorrhœa in multiparæ, when we consider that 62 per cent of 118 cases of lacerated cervix, suffering with varying degrees of menstrual pain before operation, were entirely relieved or improved by amputation of the cervix or trachelorrhaphy. The results of one operation are about as good as the other in this respect.

INFLUENCE OF AMPUTATION OF THE CERVIX AND TRACHELORRHAPHY REGARDING THE SUBSEQUENT FERTILITY OF THE PATIENT

The question of the influence of plastic operations upon the uterine cervix as regards the fertility of the patient has naturally been considered under two distinct heads: First, that group of cases in which the operation is undertaken primarily with the idea of relieving a condition of sterility; and, secondly, those cases demanding surgical interference for disease of the cervix, most of these women being multiparæ and the question of postoperative fertility being of secondary rather than of primary importance. The first group has received much attention in the literature, notably through the work of Sims (3), Champetier de Ribes, Simpson, Scanzoni, Pozzi (6), Guibout (7), La Torre (8), Morisani (9), Mangin (10), Duponnois (11), Pescher (12), Doléris (13), etc., — and all seem agreed that amputation of the cervix in cases of sterility due to such mechanical causes as hypertrophic elongation, bring very fair results. The question of the subsequent fertility of those patients coming to operation primarily for disease of the cervix has been practically neglected, however, most of the scant literature that has appeared being very unreliable on account of the faulty, or entire lack of, classification of the cases presented. In the following report, 167 cases are considered in which the full marital history following operation was obtained. The cases are divided into two classes on the following basis:

Class A. Married women under 40 years of age at the time of operation who are menstruating regularly now.

Class B. (1) Women over 40 years of age at the time of operation. (2) Cases who have passed or are at present in the climacteric. (3) Cases of double salpingectomy or other operation making subsequent pregnancy impossible or very unlikely. The cases of amputation of the cervix, 128 in number, have been previously reported on a basis of this classification. It was found that of the 72 cases in Class A, women in whom the occurrence of pregnancy would naturally be expected, but 14 cases, or 19.4 per cent, reported fertility following amputation of the cervix. In other words, although every one of these 72 women had borne one or more children before operation, over four-fifths of them have remained sterile since. Of the 39 cases in which the cervix was repaired by Emmet's method, 29 fall into Class A of this classification. Of this number, 11 cases or 38 per cent have become pregnant since operation. According to these results, fertility after trachelorrhaphy is just twice as frequent as after amputation of the cervix. The following tabulation is interesting in this respect.

FERTILITY AFTER AMPUTATION OF CERVIX

	No. Cases Class A	Av. Age at Time of Op.
	72 cases	30 yrs. 5 mos.
Fertility reported	14 cases = 19.4%	28 yrs. 4 mos.
Sterility reported	58 cases = 80.6%	32 yrs. 6 mos.

FERTILITY AFTER TRACHELORRHAPHY

	No. Cases Class A	Av. Age at Time of Op.
	29 cases	31 yrs. 2 mos.
Fertility reported	11 cases = 38%	31 yrs. 5 mos.
Sterility reported	18 cases = 62%	31 yrs.

It is evident that the age of the patients in this series of cases offers no explanation of the results obtained. Why, then, should the occurrence of pregnancy be relatively twice as frequent after trachelorrhaphy as after

amputation of the cervix? Any plastic operation on the cervix necessarily results in the formation of a cicatrix, the extent of which is dependent upon the type of operation done and the manner in which healing follows; i.e., by primary union or by granulation. After amputation of the cervix, the cicatrix resulting occupies a plane perpendicular to the long axis of the cervix and must contract, from all directions, toward the cervical canal. This sphincter-like action of the contracting cicatrix may cause a complete closure of the cervical canal with retention of menstrual blood and hæmatometra. Several such cases have been reported and one example was seen in this clinic a few months ago. The occasional occurrence of extreme cases, such as these, indicates the possibility that the same process may occur to a lesser degree, in a large number of cases, there being developed a stenosis of the cervical canal, which though insufficient to cause hæmatometra, might render impregnation very unlikely. Considerable support is afforded such an assumption by the cases of amputation of the cervix reported. Of the 14 cases reporting fertility after this operation, 10 had two or more pregnancies. This result, taken into account with the fact that 80 per cent of Class A reported sterility, would indicate that cervical stenosis is of frequent occurrence in the sterile group, for if fertilization should ensue, in spite of the stenosis, the delivery following, even though premature, would dilate the cervical canal sufficiently to render a second pregnancy much more likely of occurrence. We would expect, then, a high percentage of sterile women and repeated pregnancies in the fertile group—precisely the results obtained.

Considerably more attention has been paid to the question of fertility following the operation of trachelorrhaphy than amputation of the cervix. During the twenty years following the introduction of Emmet's operation occasional comment has been made, the question at one time being the subject of a very caustic debate between Murphy (14) of Washington and Van de Warker (5) of Syracuse. Goodell (4), after operating on 169 cases, reported that he had heard of but 7 pregnancies following, and agreed with Murphy that sterility usually follows the operation of trachelorrhaphy. As no attempt was made to classify these cases, the results mean very little, and as has been previously indicated, almost all of the reports that have appeared bearing on this question are practically worthless, as no idea is given of the percentage of fertility in that group of cases, in which pregnancy might naturally be expected to follow. This is well illustrated in the following tabulation which embodies the results of most of the reports which have appeared.

FERTILITY AFTER TRACHELORRHAPHY

Emmet (1)	Operated upon 600 cases; knew of "many" pregnancies.
Thomas (15)	Operated upon 102 cases; knew of "many" pregnancies.
Sutton (16)	Operated upon 60 cases; knew of "some" pregnancies.
Lusk (22)	Operated upon 300 cases; knew of "frequent" pregnancies.
Skene (23)	Operated upon 300 cases; knew of "many" pregnancies.
Goodell (4)	Operated upon 169 cases; knew of 7 pregnancies.
Mundé (17)	Operated upon 137 cases; knew of 13 pregnancies.
Jackson (18)	Operated upon 118 cases; knew of 9 pregnancies.
Lee (19)	Operated upon 100 cases; knew of 12 pregnancies.
Mann (20)	Operated upon 50 cases; knew of 4 pregnancies.
Wilson (21)	Operated upon 100 cases; knew of 4 pregnancies.
Baer (25)	heard from 21 cases; 6 became pregnant.
Montgomery (45)	heard from 30 cases; 5 became pregnant.
Beates (46)	heard from 23 cases; 2 became pregnant.
Ill (47)	heard from 44 cases; 12 became pregnant.
Van de Warker (5)	heard from 31 cases; 9 became pregnant
Janvrin (44)	heard from 15 cases; 3 became pregnant.
Johnson (48)	heard from 16 cases; 3 became pregnant.
Richardson (39)	heard from 17 cases; 3 became pregnant.

A number of authors, more notably Goodell (4), Murphy (14), and Gehrung (24) concluded that sterility follows the operation as a general rule and attributed this sterility to the operation itself. Baer (25), although agreeing that sterility ordinarily follows, attributed it not to the operation but to the inflammatory condition of the cervix accom-

panying laceration and upon which the operation has no effect. Wells (2), however, in 1884, seems to voice the general consensus of opinion at that time. He writes, "When we take into consideration the number of abortions, the tendency to which all admit to be much increased by the lacerated and irritable state of the cervix, it is obvious that the operation materially swells the number of births at term, not only by enlarging the number of conceptions but also by lessening the number of abortions, so that we may safely say that Emmet's operation increases the fertility of those on whom it is performed."

It has been pointed out that the cicatrix following an amputation of the cervix occupies a plane perpendicular to the long axis of the cervix, and in contracting must narrow the cervical canal to some extent. The scar left by a trachelorrhaphy is rather linear than broad and occupies a position parallel with the long axis of the cervix. In contracting, it is inconceivable how such a cicatrix could narrow the cervical canal. Granting that sterility following a plastic operation on the cervix is due usually to a stenosis of the cervical canal, the relatively greater fertility of the patients after trachelorrhaphy than after amputation finds an easy explanation in the extent and situation of the scar tissue left by the operation. At any rate, it is safe to conclude that fertility is much more likely to follow trachelorrhaphy than amputation of the cervix.

THE COURSE OF PREGNANCY AFTER AMPUTATION OF THE CERVIX AND TRACHELORRHAPHY

Audebert (26) and De Koninck (27) have insisted that amputation of the cervix exercises a marked influence on the course of subsequent pregnancies by causing very frequent abortion and premature delivery. Bernheim (28), reporting 49 cases, concluded that this is not true, but his evidence is overweighed by the work of Pescher (12), Pedobedoff (29), Guibout (7), Ducasse (30) and numerous others who have noticed this tendency to abortion following the operation. The comments to be found in the literature regarding the effect of trachelorrhaphy on the course of pregnancy are few but uniformly favorable, the general opinion being that the operation decreases the frequency of abortion.

In the following table, the influence of amputation of the cervix and trachelorrhaphy on the relative frequency of abortion before and after operation is shown, and demonstrates the superiority of the latter operation in this regard.

COURSE OF PREGNANCY AFTER AMPUTATION OF CERVIX

14 CASES

Before operation, 52 pregnancies	
Delivery at term	39, or 75%
Interrupted before term	13, or 25%
After operation, 32 pregnancies	
Delivery at term	14, or 45%
Interrupted before term	17, or 55%
Now pregnant	1

COURSE OF PREGNANCY AFTER TRACHELORRHAPHY

11 CASES

Before operation, 73 pregnancies	
Delivery at term	54, or 74%
Interrupted before term	19, or 26%
After operation, 29 pregnancies	
Delivery at term	21, or 72%
Interrupted before term	8, or 28%
Now pregnant	1

It will be seen that in each group of cases, 25 per cent of the pregnancies occurring before operation ended before term, this frequency possibly being attributable to the lacerated condition of the cervix. After operation, however, the frequency of abortion differs widely according to the type of operation performed. After amputation of the cervix, the liability to abortion is more than doubled while trachelorrhaphy has no effect upon the course of subsequent pregnancy.

Taking the cases singly, a number of interesting observations can be made corroborating the above conclusion:

PREGNANCIES AFTER AMPUTATION OF THE CERVIX

	Delivery at term	Permature deliveries	Abortion[1]
Case I	0	0	1
Case II	0	0	1
Case III	0	1 (8th mo.)	0
Case IV	3	0	1
Case V	0	1 (7th mo.)	0
Case VI	0	1 (8th mo.)	2
Case VII	1 (now pregnant)	0	0

[1] Including termination of pregnancy up to 6½ months.

Case VIII...	0	2 (7th mo. & 8th mo.)	0
Case IX.....	2	1 (6½ mos.)	0
Case X.....	2	0	3
Case XI.....	1	0	1
Case XII....	2	0	0
Case XIII...	2	0	0
Case XIV...	1	0	2
	14=45%	6=19%	11=36%

PREGNANCIES AFTER TRACHELORRHAPHY

	Delivery at term	Permature deliveries	Abortion[1]
Case I.....	4	0	3
Case II.....	1	0	0
Case III.....	2	0	1
Case IV.....	3	0	0
Case V.....	2	0	1
Case VI.....	1	0	0
Case VII....	3	0	2
Case VIII...	1	0	0
Case IX.....	3	0	1
Case X.....	1	0	0
Case XI.....	0 (now pregnant)	0	0
	21=72%	0	8=28%

In the first place, the relatively low percentage of full term deliveries after amputation of the cervix is apparent. Perhaps the most striking fact in the table, however, is the frequency with which premature delivery from the sixth to eighth month occurs after amputation of the cervix. In six instances out of 31, or in about 19 per cent of the pregnancies, premature delivery ensued, and in case 8, the only two pregnancies occurring after operation terminated by premature delivery, one at the seventh and one at the eighth month. On the other hand, not one of the 29 pregnancies occurring after trachelorrhaphy ended by premature delivery. Aside from the relatively greater frequency of abortion after amputation of the cervix, as compared with trachelorrhaphy, it is likewise of considerable interest to note that of the 14 cases in the first group (amputation of the cervix), only three cases, VII, XII and XIII, carried each pregnancy to full term, while after trachelorrhaphy, in 5 of the 11 cases, II, IV, VI, VIII and X, each pregnancy progressed to full term. It is evident that after amputation of the cervix, premature delivery is frequent as well as abortion, and that this objection does not apply to trachelorrhaphy.

[1]Including termination of pregnancy up to 6½ months.

THE CHARACTER OF LABOR AFTER AMPUTATION OF THE CERVIX AND TRACHELORRHAPHY

Post-operative cicatricial rigidity of the cervix has long been recognized as a cause of dystocia. Before the introduction of a plastic amputation of the cervix by Sims (3) in 1861, the occurrence of dystocia, in the occasional pregnancy following the crude procedures then in use, must have been almost invariable. With the use of plastic methods of amputation, securing primary union of the tissues, many authors claim that dystocia due to cicatricial rigidity has become almost unknown. Among these may be mentioned Pozzi (6), Pichevin (31), Doléris (13), Bernheim (28), Morisani (9), Ducasse (30) and Chalieux-Vivie (32). On the other hand, Guibout (7), Audebert (26), De Koninck (27), Lepage (33), Toledo (34), Martin (35), and many others have shown that dystocia after amputation of the cervix is not only of frequent occurrence but that it may reach any extreme, even causing rupture of the uterus.

After trachelorrhaphy, dystocia has evidently but seldom been met with, for references to its occurrence are very scarce. Murphy (14), who could find nothing to recommend the operation, concluded (from 11 cases collected from literature) that the character of labor is unusually severe and protracted. In this opinion, however, he is quite alone. Goodell (4), Mundé (17), Hanks (36), Lee (19), Githens (37), Ford (38), Jackson (18), Mann (20), Lusk (23), Wilson (21), Richardson (39), Skene (23), Jenks (40), and Scott (41) have all expressed themselves to the effect that trachelorrhaphy is without influence upon the character of subsequent parturition. A study of the cases from this clinic seems to corroborate the general consensus of opinion regarding the influence of both amputation of the cervix and trachelorrhaphy in this respect.

DELIVERY OF THE FIRST CHILD AFTER AMPUTATION OF THE CERVIX

	Before operation	Age[2] yrs.	Character of first labor after operation
Case IV	para II	27	Difficult labor, full term
Case V	para VIII	36	Premature delivery 7th mo. Difficult labor

[2] At the time of the first delivery following operation.

Case VI	para II	26	Premature delivery 8th mo. Easy labor
Case VII	para I	28	Difficult labor, full term
Case VIII	para V	37	Premature delivery 8th mo. Easy labor
Case IX	para I	32	Difficult labor, full term
Case X	para II	27	Easy labor, full term
Case XI	para V	29	Easy labor, full term
Case XII	para I	37	Difficult labor, full term
Case XIII	para III	35	Difficult labor, full term
Case XIV	para II	26	Difficult labor, full term

DELIVERY OF THE FIRST CHILD AFTER TRACHELORRHAPHY

	Before operation	Age[1] yrs.	Character of first labor after operation
Case I	para I	22	Prolonged 18 hours. Full term
Case II	para IV	42	Easy labor. Full term
Case III	para VII	37	Difficult labor. Full term
Case IV	para VIII	34	Easy labor. Full term
Case V	para VII	40	Easy labor. Full term
Case VI	para IV	33	Easy labor. Full term
Case VII	para VII	41	Easy labor. Full term
Case VIII	para VII	37	Easy labor. Full term
Case IX	para I	32	Easy labor. Full term
Case X	para II	23	Easy labor. Full term
Case XI	para VI		Now pregnant (7 mos.)

A glance at the above tabulation is sufficient to offer convincing evidence of the great difference in the character of the first labor after the two operations. Following amputation of the cervix, the first labor was difficult in 7 of the 11 cases, in one instance (Case V), the delivery of a seven month's child being attended with considerable dystocia. In striking contrast to this result is the fact that 8 of the 10 cases of full-term pregnancy following trachelorrhaphy had easy labors. In only one case was labor difficult, and in one other, prolonged to 18 hours. Reamy (42) attended 6 of his cases at the first labor after trachelorrhaphy. In 2 cases, dilatation of the cervix was rather slow, but each of 15 other cases heard from had normal labors. Hanks (36), Githens (37), Ford (38), Jackson (18), Mann (20), Wilson (21), Lee (19), Richardson (39), Harrison (43), and Janvrin (44) have reported a total of 34 cases seen in labor some time after trachelorrhaphy, in 29 of which labor was normal, parturition in the remaining 5 cases being described as difficult or prolonged.

The question of relaceration of the cervix during the first labor after operation has been the subject of considerable discussion. In only one of Reamy's cases was the cervix relacerated. Mundé reported relaceration in about 20 per cent of his cases. Wells, reporting 77 cases of trachelorrhaphy collected from the literature, found that in 62 cases, or 80 per cent, the cervix was not lacerated during the first labor after operation, while of the remaining 15 cases, 8 were but slightly lacerated. Unfortunately, a reliable report on the cases from this clinic, regarding this point, could not be obtained.

Whether relaceration of the cervix occurs commonly or not, we may at least safely conclude that dystocia, due to cicatricial rigidity of the cervix, is common after amputation, while following trachelorrhaphy, is unusual.

I wish to express my thanks to Dr. Howard A. Kelly, from whose clinic in the Johns Hopkins Hospital these cases are reported, and to Dr. Wm. W. Russell, my gratitude for his interest in the work and the many valuable suggestions he has offered.

CONCLUSIONS

1. The presence of a marked endocervicitis should be considered as a contra-indication to the performance of trachelorrhaphy.

2. Although serious post-operative hæmorrhage is not infrequent after amputation of the cervix (5 per cent), this accident is very uncommon after trachelorrhaphy.

3. The influence of trachelorrhaphy in improving the general condition of the patient is, in properly selected cases, quite as marked as that of amputation of the cervix. In each instance about 90 per cent of the patients report improvement in the general health.

4. Although trachelorrhaphy may render a mild endocervicitis more amenable to treatment, it can not be considered, like amputation of the cervix, as a curative measure for this condition.

5. Laceration of the cervix is a frequent cause of dysmenorrhœa in multiparæ, and its removal by either amputation of the cervix or trachelorrhaphy is followed by the disappearance or amelioration of menstrual pain in over 60 per cent of cases.

6. Fertility is much more likely to follow trachelorrhaphy than amputation of the cervix.

[1]At the time of the first delivery following operation.

7. After amputation of the cervix, the incidence of abortion and premature delivery is greatly increased, while trachelorrhaphy has no effect upon the course of subsequent pregnancy.

8. Labor after amputation of the cervix is usually difficult, while after trachelorrhaphy it is almost always normal.

9. Amputation of the cervix is an operation to be avoided in women in the child-bearing period until all other therapeutic means have been exhausted.

10. Trachelorrhaphy has a therapeutic efficiency, in properly selected cases, quite as high as amputation of the cervix, and, having no influence upon the subsequent marital history of the patient, is the operation of choice for women in the child-bearing period.

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SYPHILIS OF BONES AND JOINTS

With a Report of Ten Cases

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THOUGH syphilis of the bones and joints is not seen in our orthopedic clinics as often as the tubercular affections, still it is said with assurance that more patients are afflicted with syphilis of the bones and joints than are reported in the literature. Many cases of bone syphilis are unrecognized or diagnosed as tubercular. The reason is merely that we have not enough signs as yet by which to recognize this affection early.

Even if we could succeed in obtaining specimens in an early stage, we would not easily verify the diagnosis for the reason that the histologists give us no definite histological findings by which to differentiate this condition from other similar ones.

It is, therefore, of the utmost importance that every case of syphilitic disease brought to the observation of the orthopedist should be placed in the medical literature, and perhaps in this way some cases may be diagnosed early and proper treatment may be instituted. The prognosis of the luetic attack of the bones and joints is much more favorable than general syphilis and early treatment is therefore of special importance.

This justifies the writer's reports of those cases that came to his attention during the last year. Since he was fortunate enough to have patients showing different varieties of bone and joint syphilis, it will not be out of place to give a short résumé of the symptoms and the signs known up to recent date concerning the changes in those tissues.

A. BONE LESIONS

Bone lesions occur commonly in the hereditary form and in the tertiary stage of the acquired disease.

I. *Hereditary syphilis.* (*a*) Early forms of hereditary syphilis occur soon after birth. It takes the form of an osteochondritis and involves several bones. The lower extremities are the first ones to be attacked. Gelatinous masses are formed beneath the periosteum and at the epiphyseal line, producing occasionally true fractures of the shaft or separation of the epiphysis. There is a thickening of the periosteum and bone cortex. The cartilage is also involved, namely, there is a multiplication and irregularity of the cartilage cells of the ossifying layer and premature calcification. Necrosis may be present, as shown by a zone of hard, dry, yellow substance in the ossifying layer. The newly formed bone is softened and replaced by granulation tissue. If the disease is progressive, ulceration and suppuration may follow. The cartilage may be destroyed and growth stopped. The fact that it involves the diaphysis sparing the joint differentiates this condition from a diffused tuberculosis. The absence of high temperature and comparative mildness of the symptoms in proportion to the large area of bone involvement differentiates it from osteomyelitis. On account of the swelling of the soft parts, the condition simulates true joint lesion, but a careful examination will elicit the fact that the joint is usually free. The cartilages of the ribs are also commonly involved.

Case 1. M. S., female, age 2½ years, born in the United States of Italian parents. Mother brought the baby to Vanderbilt Clinic, complaining that the child never walked. The child had no night cries and no fever at any time (?). Examination showed a very undersized child. The upper extremities and the ribs showed deformities simulating rickets. The child had no teeth whatever. Many glands were enlarged. The spinal motions free. The left hip showed muscular spasm. The thigh was kept in a flexed position at an angle of 110°. The spasm could be easily overcome. There was very little limitation of motion in the hip. At the junction of the upper and middle third of the thigh and the outer surface there was a marked swelling with an opening toward the surface. The swelling was not red. A profuse thin greenish discharge could be pressed out from the tumor by the slightest pressure. Mother related that the swelling occurred about one

year ago and at the same time the discharge started. This was really the first thing that called mother's attention and induced her to consult her family physician. The discharge could not be stopped by him in spite of all his efforts by ointments and dressings. The fact that the child was unable to walk grieved the mother and she came to the clinic.

On further examination it was found that the other thigh had also some swelling of the femur but no discharge and also some limitation of motion in the hip. As the mother was a foreigner and ignorant, it was hard to obtain a satisfactory history of syphilis but it seemed that she had had two or three miscarriages.

The patient was examined by Prof. V. P. Gibney, who diagnosed it as hereditary syphilis. Unfortunately the case disappeared from observation and we could not take radiographs. Wassermann and other syphilitic tests, but the diagnosis of such a reliable diagnostician as Gibney can be relied on. The clinical facts here given show also the real nature of the case. We can easily see that the main lesion was at the epiphyseal junction of both femora. There probably was necrosis and suppuration, which opened afterwards at the surface.

(*b*) In late hereditary syphilis cortical thickening and calcareous deposits beneath the periosteum are common, giving rise to sabre-shaped tibiæ and tender fusiform swellings along the shafts of the long bones. Frequently small areas of rarefaction with a cap of dense bone raised above the line of the normal shaft are seen in the skiagraph. These have been called "bone blisters." Beneath the periosteum can frequently be found a calcareous deposit which appears as a faint area bulging along the shaft and resembling early callus. It is confused usually with early osteomyelitis proper or osteomyelitis serosa or periostitis albuminosa or certain cases of giant-celled and periosteal sarcoma. An important aid in the diagnosis of hereditary syphilis is the presence of keratitis.

CASE 2. D. J., male, age 19, born in the United States, motorman. Family history: Parents alive and well, but father and mother live separated. Both parents denied syphilis (according to the patient's report at his second visit). Patient does not know whether his mother had miscarriages or not. Personal history: Has always been healthy, and does not remember ever having been sick. Denies ever having had sexual intercourse. Does not use alcoholic beverages. Present illness dates back six months, when patient noticed a swelling on the left tibia on inner surface. Does not remember any trauma that might have produced it. Had no pain whatever when ailment started. About one month later he noticed a small opening at the middle of the tibia. A small amount of blood exuded causing no pain whatsoever. About the same time a similar opening and bloody discharge occurred at the right tibia. Both openings closed. Lately the swelling of the left tibia has been increasing, giving rise to slight pain and making the process of walking uncomfortable, but had no pain at night. Came to the Vanderbilt Clinic in January, 1913.

Physical examination: The young man was robust and well built; slight saddle-shaped nose. Teeth showed no Hutchinson's peculiarities. The cervical, axillary, trochlear and inguinal glands were enlarged. There was a marked irregular swelling on the inner surface of the left tibia extending from inner tuberosity to about the middle of the tibia where a small opening covered by a scab was observed. This tumor was not tender. The joint was freely movable. No other bone was involved. The skiagraph (Fig. 1) shows that the periosteum is very thick and there is dense bone raised above the line of the normal shaft. The faint area bulging along the shaft beneath the periosteum is probably calcareous deposit. The Wassermann reaction was very strongly positive (four pluses). This case is probably a late hereditary syphilis, as he had no symptoms of first and secondary stages.

II. *Acquired syphilis.* The affection of the bone usually occurs in the tertiary stage. The pathological findings are the same as in late hereditary form. In acquired syphilis we have also bone gummata in the third stage, of which there are two forms, (1) superficial, and (2) deep.

1. The superficial gummata occur between the bone and the periosteum causing ulcerations of the cortex. The gummata may join each other in a stellate manner. Tousey points out the following radiographic findings in superficial gummata — on one side of the bone, the corticals are thinned by irregular patches of rarefaction. Its uniform outline can no longer be traced. The periosteum is intact over a swelling which shows more or less ossification. At the extreme margins it is clearly noticeable that the swelling is a periosteal one, as the bony contour is preserved with the less dense shadow of the periosteum springing away from it.

2. The deep gummata occur in any part of the bone and may cause fracture.

Patient may have diffused syphilitic osteomyelitis which does not show on the radiograph. Syphilis may produce vertebral lesions and simulate Pott's disease.

B. JOINT LESIONS

It is an established fact that syphilis plays an important part in causing arthritic symptoms though frequently not diagnosticated.

I. Hereditary joint lesions. Von Hippel found that 56 per cent of hereditary syphilitics show joint lesions. Kaufman in "Special Pathology" asserts that they usually take the form of exudative arthritis caused by a neighboring gumma or an osteochondritis breaking through the epiphysis into the joint. Kirmisson and Jacobson classified the hereditary forms of syphilitic joint disease as follows: 1. A single osteo-arthropathy beginning insidiously with severe and persistent nocturnal bone pain. One of the bony extremities enlarges and the condition simulates tumor albus. Hyperostoses may be present. The limitation of motion is usually mechanical. 2. The important feature may be only hydrops. The synovia is thickened locally or diffused but there are no bony changes. The fluid of the joint is markedly increased. 3. Deforming osteo-arthropathy where the epiphyses are irregular.

II. Acquired syphilitic joint lesions. The primary stage may be accompanied by acute fibrile arthritis (Goldthwait, Osgood, and Painter). In the secondary stage we usually have (*a*) simple arthralgia without objective symptoms. Pain is distinctly localized over tendons and ligaments and is worse at night, probably due to pressure from distended veins. This form very rapidly yields to mercurial treatment. (*b*) Subacute arthritis characterized by slight effusion and swelling with white or only slightly reddened joints. This form is rare. (*c*) Hydrops, i. e., where the increase of the fluid is the first symptom. The course is slow and insidious. The knee joint is mainly involved.

In tertiary syphilis the joint together with the bone or the joint itself may be involved. We have therefore two types: (*a*) Synovial type, where a marked effusion is followed by a gradual onset. The pain is sharp. This form is usually monoarticular and mostly affects the knee. Motion of the joint is normal. Considerable muscular atrophy accompanies it. (*b*) Bony type, in which we find marked hyperostosis. The extremities of the bones become enlarged, smooth and rounded. Pain is greater at night. May result in ankylosis or great relaxation and hypermobility. Gummata may also be present in the arthritic lesion. We have two types of articular gumma: (*a*) periosteal, or capsular, which spreads into the articulation and produces villi containing minute gummata. This form usually produces destructive changes in the cartilage and the bone. (*b*) Primary osteal form extending into the joint producing destructive changes in the bone and the cartilage and may result in suppuration and ankylosis.

CASE 3. N. P., female, married, age 22, born in the United States of Irish parents. Family history is negative. Personal, has always been well. Married at seventeen, husband was twenty-one, has three healthy children and has had no miscarriages. Husband denies syphilis. Previous history: Had a cataract since the age of five.

Present illness dates back one and a half years, when patient began to complain of severe pain in the left knee. The knee became swollen but not red. In four weeks the motion of the joint became limited, so that patient could not extend the leg more than to an angle of 135°. The pain was more severe at night. Patient gave a history of trauma six months previous to the occurrence of the swelling but it really had nothing to do with the disease. This trauma occurred in a railroad accident and she attributed the knee affection as a sequence to it while bringing action against the company. The truth of the writer's assumption that the knee affection had nothing to do with the injury is verified by the fact that on taking her history for the first time she did not mention anything about the injury. It was only after consulting her legal attorney that she mentioned the injury. We mention this for the reason that on frequent occasions one may attribute such an attack to the trauma and not think at all of syphilis. She came to the Clinic on July 26, 1912.

The physical examination showed a healthy, robust young woman. Station: No Romberg. Gait: Walked with a limp, bending toward the left side. Eyes reacted normally to light and accommodation. Cataract on left eye. Some glands were palpable. The left knee was very large. The outline of the knee was abolished. Patella freely movable, though slight tenderness elicited on touch. Motion revealed pain and patient could not extend knee more than to an angle of 135°. No grating in the joint. No rice bodies. No pain on jarring; not relieved much by traction. A radiograph (Fig. 2) was taken at that time, which showed thickening of internal border of the periosteum of femur, irregular outline, i.e., raised in some places. The patella was removed from femur. No destruction of bone, no rarefaction. No fracture visible. The synovial membrane was not shown very clearly.

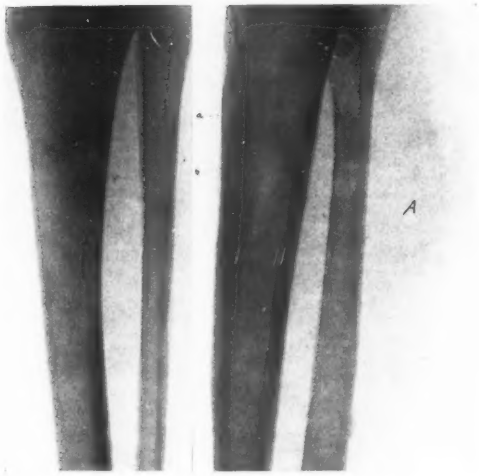

Fig. 1. Case 2. February 13, 1913. A, left leg. Note the thickening of the periosteum. a, dense bone raised above the line of the normal shaft; b, faint area bulging along the shaft of the periosteum is probably calcareous deposit. Unfortunately the osteo-chondreal line did not come out well to show whether there is the characteristic osteo-chondritis. B, right leg; no thickening of periosteum.

In considering the diagnosis, tuberculosis could be ruled out at once, as an affection lasting for a year and a half would show more symptoms and more destruction of bone. Osteomyelitis was eliminated

Fig. 2. Case 3. Before starting any treatment. September 27, 1912. A, lateral view; B, antero-posterior view; a, thickening of periosteum; b, irregular outline of periosteum. There is no destruction, no rarefaction, nor fracture. Note marked separation of patella from femur.

Fig. 3. Case 3. February 3, 1913. The periosteum is markedly thickened on both sides, especially at a, though the pain was markedly diminished. There is no destruction. The cartilage is almost normal.

on account of absence of fever and acute symptoms. Chronic synovitis — shows no radiographic change. of the bones. Sarcoma has no increase of fluids Gonorrhœal arthritis — by the comparative mild symptoms. We therefore believed that it was probably a syphilitic joint. The patient had been taking some medicine prescribed by a private physician, but we could not ascertain whether it was anti-syphilitic treatment. We did not therefore take a Wassermann test. Meanwhile we immobilized the knee in a removable plaster cast and advised the use of Bier's hyperæmia for two to four hours daily. Patient used also applications of hot and cold douches before retiring. After a few months' treatment the swelling was markedly diminished. Pain became less, especially during the night. Could bring the leg up almost to a straight line with the thigh. Tenderness was less. Was told to continue the treatment with the addition of exercises for ten to fifteen minutes twice a day. The improvement continued. We then took a Wassermann test which was very strongly positive (four pluses). The radiograph at that time (Fig. 3) showed the following findings: The periosteum more thickened on both borders of the femur, more irregular but no destruction or rarefaction of the bones found. Joint is clear.

Fig. 4. Fig. 5.

Fig. 4. Case 4. Left elbow-joint, lateral view shows considerable amount of periosteal proliferation involving the head and upper two inches of shaft of the radius. Area of absorption (a) present. Olecranon process is also involved.

Fig. 5. Case 4. Antero-posterior view of same joint as Fig. 4. The thickened area of the periosteum and the absorption is more clearly shown.

On Feb. 21, 1913, patient received an intravenous injection of neosalvarsan (0.9 gm.). The pains stopped entirely within three days. On Feb. 26, 1913, patient was put on mixed treatment. On March 17, 1913, patient received another injection of neosalvarsan (0.9 gm.) and was still kept on the mixed treatment. At present the patient has no pain whatever, walks perfectly well. No tenderness. Swelling has almost entirely disappeared. This case shows distinctly how easily the diagnosis of syphilis can be overlooked. This case belonged to "bony type of tertiary syphilis."

CASE 4. K. E., male, single, age 32, born in the United States, Hebrew, salesman. Previous history gives a distinct history of syphilis five years ago. He was treated with three injections of salvarsan followed by mercury but for a short time only. Present illness: For the last six months patient has been suffering from marked pain in the left elbow joint. The pain is markedly increased on motion but does not become more acute at night. For the last month the elbow-joint is markedly swollen. Was observed by the writer for the first time on May 15, 1913. Physical examination showed a markedly swollen elbow-joint, no redness. Cannot flex the elbow beyond the angle of 100°. Extension only up to an angle of 135°. Pronation is markedly limited while supination is slightly limited. Keeps the forearm midway between supination and pronation. The joint is very tender to the touch. The tibiæ show marked rough surfaces. General symptoms of syphilis are present. Mucous

Fig. 6. Fig. 7.

Fig. 6. Case 5. Note the increase of the joint and the loss of contour. Patient had to support himself while the picture was taken.

Fig. 7. Case 5. The hyperextension is clearly brought out.

membranes of nose and throat are diseased. The radiograph (Figs. 4 and 5) shows marked thickening of the upper extremities of ulna and radius. The olecranon and coronoid processes markedly involved. A small area of absorption is seen at the radius. The radiograph of the tibiæ brings out especially the marked thickening of the periosteum. This case presents therefore the bony type of joint lesion of tertiary stage.[1]

DIAGNOSIS OF SYPHILIS OF BONES AND JOINTS

As we have seen above, there is no definite sign to recognize this affection. A history of hereditary taint and of venereal lesion or secondary manifestation of the disease are the most important aids in verifying the disease. The Wassermann reaction should not be omitted. Radiographic findings are of great help. The thickening of the perios-

[1] Since writing this article patient has received an intravenous injection of neosalvarsan (0.9 gm.) followed by subcutaneous injections of hydrargyr. salicyl. (0.06 gm.) every fifth day and large doses of KI internally. The joint was immobilized for part of the day while for two to three hours daily some exercises prescribed. Within one month, pain and swelling have entirely disappeared. Could extend the forearm to a straight line. Supination and pronation — free. Flexion up to an angle of 80°.

Fig. 8. Case 5. A, the left knee joint; B, the right knee joint; a, destruction of the head of the tibia is seen; b, the proliferation and hypertrophy of the bone occurring at the same time is noticeable.

teum is of marked significance. The osteochondritis is characteristic of hereditary syphilis.

We must remember that syphilis shows a productive osteitis while tuberculosis usually shows a rarefying osteitis. In some cases it is hard to distinguish it in the radiograph from acute osteomyelitis or healed tuberculosis.

Prognosis is good as far as relief from pain and restoration of function are concerned but changes in bone structure will still be found in the radiograph on future examinations. The relief from pain in Case 3 following the immobilization was remarkable.

Treatment. Strong antiluetic measures should be instituted. We are accustomed to give two or three injections of salvarsan or neosalvarsan in an interval of three weeks, followed by intramuscular injections of mercury salicylate (0.06 gm.) every five days, while potassium iodide is pushed to the limit. In the acute stage immobilization of the joint for brief periods is advisable.

C. ALLIED CONDITIONS TO SYPHILIS

Whenever one writes or studies about syphilitic bone lesions, he at once associates with it Charcot's joint and other tabetic conditions, as "syphilis is by far the most important factor in causing tabes dorsalis" (Dana). We shall therefore devote our attention also to Charcot's joints. Charcot's disease is a destructive osteo-arthritis. Its pathology resembles hypertrophic arthritis. The cartilages degenerate and are worn away by movements of the limb together with the underlying bone. There is also in addition an exaggeration and irregular formation of cartilage and bone about the periphery of the joint. Synovial membrane is hypertrophied and occasionally there are calcareous deposits in the meshes of the membrane. There is an increase in joint contents. The newly formed bone is soft and spongy.

The symptoms of Charcot's joint are: (*a*) swelling which extends to surrounding parts and is due to effusion; (*b*) laxity of the ligaments and deformity soon following; (*c*)

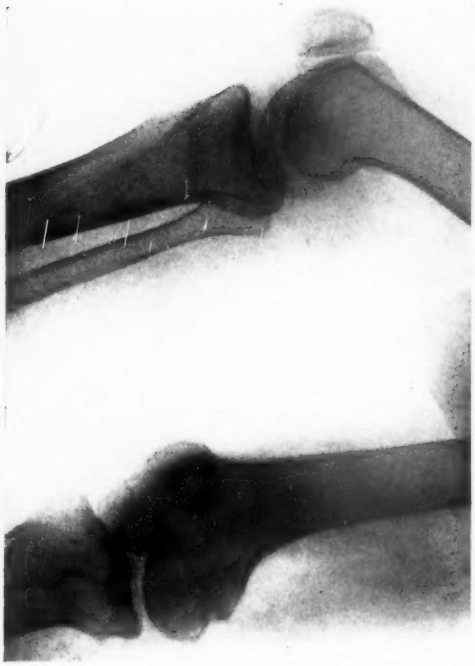

Fig. 9. Case 6. Both knees. The destruction of the bone is visible especially at the extremity of the femur. Some hypertrophy can also be noticed.

Fig. 10. Case 7. Showing the marked genu valgum.

no local pain or sensitiveness but weakness and distortion of the limb. The joint most commonly involved is the knee.

CASE 5. F. L. P., male, single, age fifty-four, born in the United States, patient in Montefiore Home. Family history, negative. Personal: Patient admits having had several attacks of gonorrhœa. Had a chancre thirty-four years ago followed by secondary syphilitic symptoms; had also some bone pains at the same time. Present illness: For the last two and a half years patient has had tabetic symptoms. About the same time patient noticed that the left knee became weaker and could not bear any weight. Had no pain whatever at the knee. The joint became markedly swollen. The weakness in the knee had increased to such an extent that patient was forced to use crutches during the last year. Physical examination showed Argyll-Robertson's pupils and other signs of tabes. The left knee (Figs. 6 and 7) is enlarged, outline of the joint is changed. There is a great deal of hypertrophic osteitis. A good deal of crepitus and loose bodies are evident. Patella is mobile. Under surface of patella is smooth. No redness or tenderness of the joint. Measurements: Circumference of the right knee at the middle of patella is 13¾ inches while the left is 16 inches. The circumference of the right calf at its greatest volume is 13¾ inches while the left calf is 14 inches. Motion of the joint: Flexion of the knee is not limited. The knee can be hyperextended to fifteen degrees beyond straight line. Lateral motion is increased. Abduction, fifteen degrees, and adduction, fifteen degrees to the side of the middle line. Wassermann Test: the blood is negative while the cerebrospinal fluid gives a strongly positive Wassermann, an excess of globulin, excess of albumin. There are 152 cells to the cmm. in the cerebrospinal fluid. The radiograph (Fig. 8) shows the marked destruction of the bone together with the hypertrophic changes.

CASE 6. A. S., female, widow, age 52, born in Russia, Hebrew. Family history negative. Personal history: Had one miscarriage and no other children. Does not know the cause of the death of her husband. Present illness: For the last four years patient has been complaining of marked weakness in both feet. No other complaints.

Physical examination showed many signs of tabes. There is a considerable emaciation of muscles of both legs. Right knee: Contour of the joint changed; patella freely movable; loose bodies in the joint. Hyperextension and lateral motion in the knee is permitted. Hyperextension to an angle of fifteen degrees. Abduction also to an angle of fifteen degrees. Left knee showed also presence of loose bodies in the joint. Hyperextension of the

Fig. 11. Fig. 12.

Fig. 11. Case 7. Antero-posterior view showing how the inner extremity is thickened producing the genu valgum.

Fig. 12. Case 7. The hypertrophy at the lower extremity of the femur, patella, and the upper extremity of the tibia is apparent.

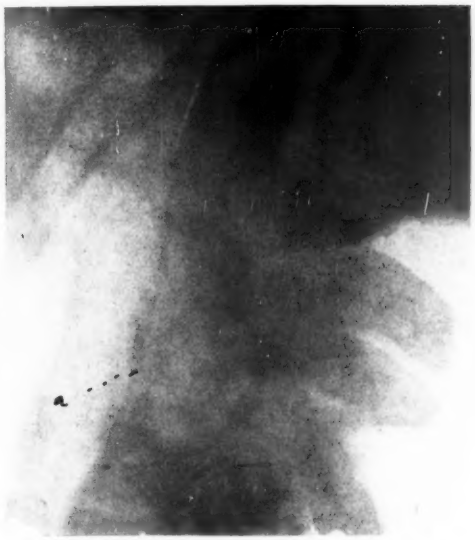

Fig. 13. Case 8. Destruction of the body of the second cervical vertebra is seen at (a) which gave the pressure symptoms.

knee to an angle of forty degrees. Abduction to an angle of twenty degrees. Measurements: Circumference of right leg below patella, 10 inches; left, 12 inches. Circumference of right thigh at three inches above the lower border of patella 11¼ inches, while left is 11¾ inches. Right calf at its greatest circumference is 8½ inches; left calf, 9½ inches. Both hip joints are lax. Wassermann, negative. The radiographic findings (Fig. 9) marked destruction of the bones together with hypertrophy.

Case 7. J. J., male, widower, age seventy-seven, born in Germany. Previous history: Had gonorrhœa and bubo at twenty. He does not know whether he has had a chancre. Has had tabes for the last twelve years. For the last nine years has had marked weakness of left knee and a gradual production of knock-knee.

Physical examination: Has many signs of tabes with marked genu valgum of left knee (Fig. 10). There is an excessive lateral motion of the knee permitting 10° to each side. The knee can be slightly overextended. There are rice bodies palpable in the knee, especially under the patella. Palpation elicits some disorganization of the joint tissues. Marked varicose veins present on left leg. The right knee presents only very slight genu valgum, otherwise it is normal. The radiograph (Figs. 11 and 12) shows the destruction and hypertrophy of the lower extremity of the femur at the inner tuberosity. The tibia and patella show also destruction.

Vertebral osteo-arthropathy. Besides the knee involvement we have vertebral osteo-arthropathy. S. Fosdick Jones, in an article "Vertebral Osteo-arthropathy,"[1] gives a careful review of the literature. He found only thirty cases reported. He adds two of his own. This shows how this condition is often overlooked, as there were surely more than thirty-two cases since 1874. He maintains that most observers have found that the vertebræ were compressed and reduced in height and enlarged laterally. The intervertebral discs were thickened and ossified. The symptoms are usually those of pressure of the enlarged bone when pressure of the cord is produced.

Case 8. W. G., male, age 55, married, born in Germany, patient of the Montefiore Home. Previous history: Had a chancre at the age of twenty-two. No secondary symptoms. Present illness dates back two years when patient began to complain of inability to use freely his lower extremities and of paræsthesis. The upper extremities were also markedly weakened. When admitted to the home, patient was bed-ridden. Physical examination revealed some indefinite signs of tabes. Marked spasm of the muscles of neck so that patient was unable to rotate head laterally. Flexion fair. Could not extend the head backward. On supporting the chin and lifting up the head the spasm was

[1] Am. J. Orthop. Surg., 1913, x.

Fig. 14. Case 9. Showing the marked angular kyphotic protrusion at the lumbar region.

markedly diminished. Patient had no pain in the neck whatever. Neurological status showed absence of knee-jerks; abdominal reflexes diminished. Babinski, present. No ankle clonus. Sensation, pain and tactile, normal; delayed thermal sensation.

The radiograph (Fig. 13) showed the destruction of the body of the second cervical vertebra. Wassermann was positive. The diagnosis of vertebral osteo-arthropathy with pressure on the cord was made. The patient was put in a plaster jacket with a jury mast. The paræsthesis of the lower extremities disappeared in one or two days. Within three weeks patient was able to walk. Patient lived about two years longer, wearing a corset all the time. He finally died from chronic nephritis. Unfortunately we were unable to obtain permission for an autopsy.

CASE 9.[1] J. F., age 53, male, born in Hungary, Hebrew, patient of Montefiore Home. Previous history: Had gonorrhœa and chancre at twenty-five. Has had tabes for the last eighteen years. In 1900 he noticed a marked kyphosis of the lower spinal region, had no pain or tenderness of the spine. He was seen by Charcot, who diagnosed it as vertebral osteo-arthropathy. Since 1904 patient has been unable to walk and has been confined to bed. Physical examination: Patient has all the definite signs of tabes. Wassermann negative. Has marked hypotonia of all the muscles of the body. At the sacrolumbar joint there is an angular kyphotic protrusion present with a secondary lordosis to the left (Fig. 14). No signs of inflammation. At one time a swelling occurred over the Charcot's kyphos. The swelling was increasing in size but patient had no pain. It only gave him some discomfort when lying down. The fluid was aspirated and found to be degenerated leucocytes and plenty of débris but no bacteria.

[1] This patient was seen by Charcot personally in 1900 (?) and was probably included in his reports.

Fig. 15. Case 10. Ununited fracture of the neck of the femur. Some new bone is thrown out.

Many cases of spontaneous fracture occur in tabetics due to the spongy condition of the bones and this is frequently the first symptom observed. This may be the first impetus to call the attention of the physician to examine the patient carefully, and one finds that patient has Argyll-Robertson's pupils, loss of knee jerks, etc. H. L. Taylor in a recent paper reports nine cases of spontaneous fractures coming under his observation. Crush fractures of the tibial tuberosities are especially liable to be followed by Charcot's joints.

CASE 10. D. W., male, married, age 53. Previous history: Has had tabes for the last fourteen years. Gives a distinct history of syphilis. While walking he slipped on the floor or, as he expressed it, "the knees gave way," and patient broke the neck and shaft of the left femur (Fig. 15). They never united although two years passed, and patient was confined to bed ever since.

I am greatly indebted to Dr. George R. Elliott, visiting orthopedist of the Montefiore Home and Hospital, for his kind assistance,

to Dr. S. Wachsmann, medical director of Montefiore Home for permission of reporting the cases, to Dr. C. Gottlieb and to Dr. S. Ehrenreich for taking the radiographs of the above reported cases.

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THE INGUINAL ROUTE OPERATION FOR FEMORAL HERNIA; WITH A SUPPLEMENTARY NOTE ON COOPER'S LIGAMENT[1]

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THREE recent contributions to the literature of femoral hernia by Moschcowitz (1), Lance (2), and Didier (3) render it unnecessary to review the subject from a bibliographic point of view. There are certain fairly well-rooted misconceptions regarding femoral hernia, however, that call for correction. Among these false notions, the three most important are, that the repair of a femoral hernia is an essentially simple operation, that recurrence is a great rarity, and that, as contrasted with the typical inguinal hernia operation, the technique for femoral hernia does not require an anatomical exposure of the operative field. The fallacy regarding the simplicity of repairing a femoral hernia is easily demonstrated by witnessing a hospital house surgeon, thoroughly competent to do routine operative work, attacking his early series of femoral herniæ; if this does not furnish conclusive evidence, one has only to tackle a femoral hernia of the variety with a small empty sac, surrounded by a large clump of preperitoneal fat, in an obese subject, or better still, a strangulated femoral hernia requiring intestinal resection, and presenting the difficulty of pulling down sufficient healthy bowel to perform an anastomosis.

The statement that femoral hernia does not tend to recur, if only the sac is ligated and no attempt is made to close the femoral ring, is not true. In the case of inguinal hernia, three factors are supposed to safeguard against recurrence: (1) High ligation of the sac; (2) snug closure of the internal ring, with secure buttressing of the abdominal wall; and (3) aseptic wound healing. It is difficult to see why these same factors should not govern in the case of femoral hernia. As a matter of record, recurrences occur with astonishing frequency after femoral hernia operation. Bresset (quoted by Lance) studied 395 femoral herniæ, and of this number 232 which were operated upon without closure of the femoral ring showed a 29 per cent recurrence, and 163 which were operated upon with the

[1] From the Anatomical Department of St. Louis University.

closure of the ring showed an 8.6 per cent recurrence. Moschcowitz (loc. cit.) reports an interesting case in which he had operated for femoral hernia and had secured a seemingly ideal result. About a year and a half later he was obliged to perform a laparotomy on the same patient. Examination from within the abdomen revealed a recurrence, the sac being two inches deep. Pott (4) analyzed 422 cases of femoral hernia and found that there was 36.7 per cent of recurrences in those cases in which the femoral ring was not sutured, and 28.4 per cent of recurrences in those cases in which the ring was sutured. (The methods used for closing the ring were such that secure closure was impossible.)

The third fallacy, namely, that an anatomic exposure of the field is not essential in the performance of an operation for the cure of femoral hernia, serves as the chief point of attack of our contribution to the subject. We wish to show that such exposure is not only essential, but also that by considering and making it essential we, at the same time, render femoral herniotomy a much simpler operation and one much less likely to be followed by recurrence. Possibly the reason why anatomic exposure has not been considered necessary is that the vast majority of femoral herniæ are repaired by the crural route; and when a femoral hernia is attacked through a thigh incision, it is physically impossible to secure an anatomic exposure. This statement is beyond all doubt or question and may be proved easily by anyone who will take the time to dissect the region of the femoral ring and canal.

It is an unfortunate fact that practically all the illustrations of the anatomy of the femoral ring, in practically all the standard text and handbooks of anatomy and surgery, are so made that the average individual cannot orient himself properly in regard to the structures pictured. It is equally unfortunate that probably the most important structure utilized in the closure of the femoral ring, namely, Cooper's ligament, is not only not pictured in any of the anatomies, but also is not adequately described in most of them. For these reasons we have dissected a female pelvis and have had it drawn accurately to scale to show the exact anatomic relationships at the femoral ring.

Figure 1 is a representation of a female pelvis tilted slightly downwards and viewed from the front, and slightly from the right side (left side of the observer). The abdominal muscles have been cut away, the external oblique aponeurosis has been trimmed off, just above its reflection, and the transversalis fascia has been cut away just above the point where it begins to line the pelvis. This illustration shows the femoral ring, occupied by a loop of ileum and bounded by the following structures: Externally, by the external iliac vein, anteriorly by the Poupart's ligament, internally by Gimbernat's ligament (which is covered by a reflection of the transversalis fascia and which, therefore, is not lettered in the illustrations) and posteriorly by Cooper's ligament, investing the iliopectineal line of the os pubis. (The deep epigastric artery, which shows in our other illustrations, is concealed by the loop of ileum.)

A properly performed operation for the cure of femoral hernia by the inguinal route renders it possible to outline the structures in and about the femoral ring as clearly as they are pictured in our illustration, difficulty being encountered only in very obese subjects. The incision is the usual one for the repair of inguinal hernia, modified only in so far as its lower end approaches the pubic region more closely than does the ordinary inguinal hernia incision. The incision should be from three to four inches in length and, if necessary, may be continued downward onto the thigh, as is described later under "step 4."

The second step in the operation consists in dividing the aponeurosis of the external oblique in the direction of its fibers.

The third step is illustrated by Fig. 2. By raising up the upper flap of the external oblique aponeurosis, the conjoined internal oblique and transversalis are brought into view, a retractor is slipped under these muscles and used to retract them upward. Another retractor is slipped under the lower flap of the external oblique aponeurosis, which is retracted downward, bringing Poupart's ligament into full view. A bridle of tape or gauze is now passed under the round ligament

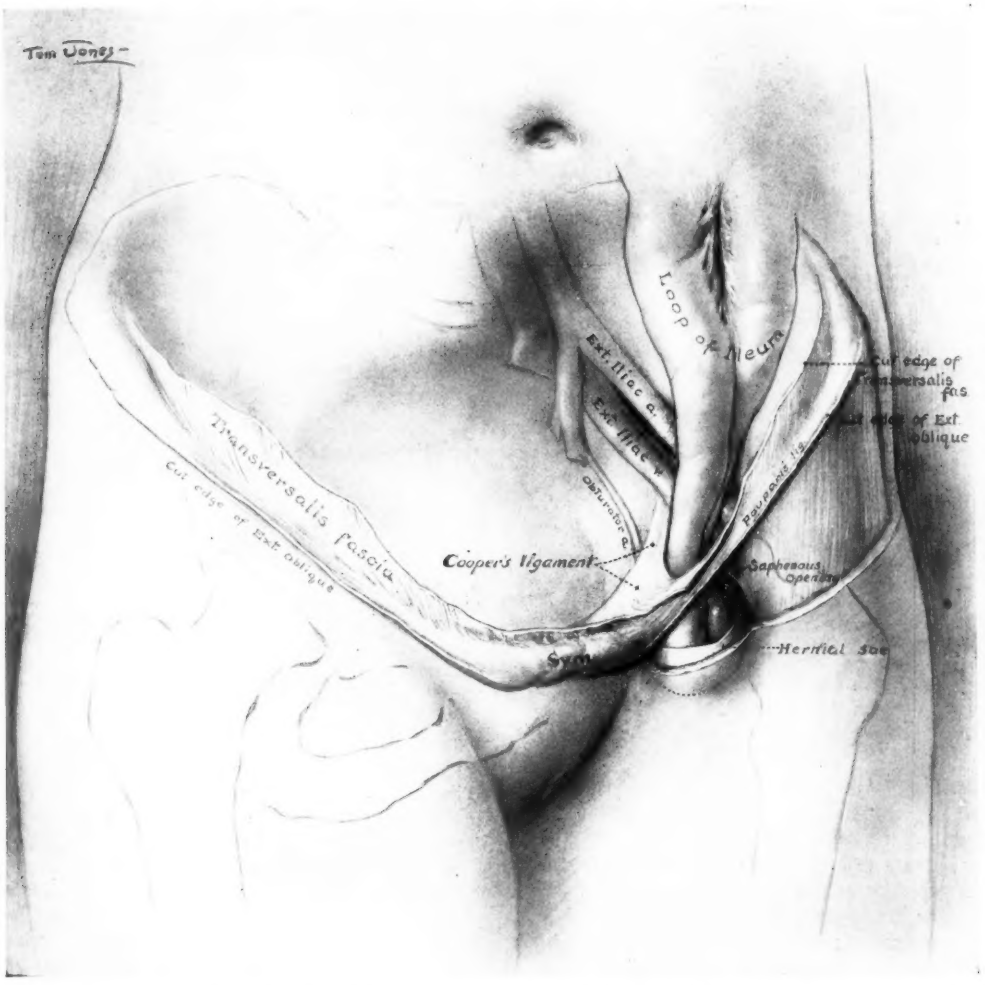

Fig. 1. Dissection of female pelvis to show the structures forming the femoral ring. The pelvis is tilted slightly forward and is viewed slightly from the right side.

or spermatic cord, and used to retract either of these structures upward. Good retraction gives a very free exposure of the field of operation, at this stage, and presents to view the transversalis fascia — a thin layer of fascia lying immediately anterior to the peritoneum. This transversalis fascia is nicked, divided bluntly along the line of the original incision, and then picked up in the retractors exactly as were the other structures of the upper and lower flaps of the incision. Good retraction brings the peritoneum into view and exposes the neck of the sac. In Fig. 2 the upper flap of the transversalis fascia is shown in the retractor and the lower flap is pictured free in order to illustrate its relationship to the underlying peritoneum. The deep epigastric artery is usually encountered during this stage and may be retracted or, if it runs an anomalous course, divided between ligatures.

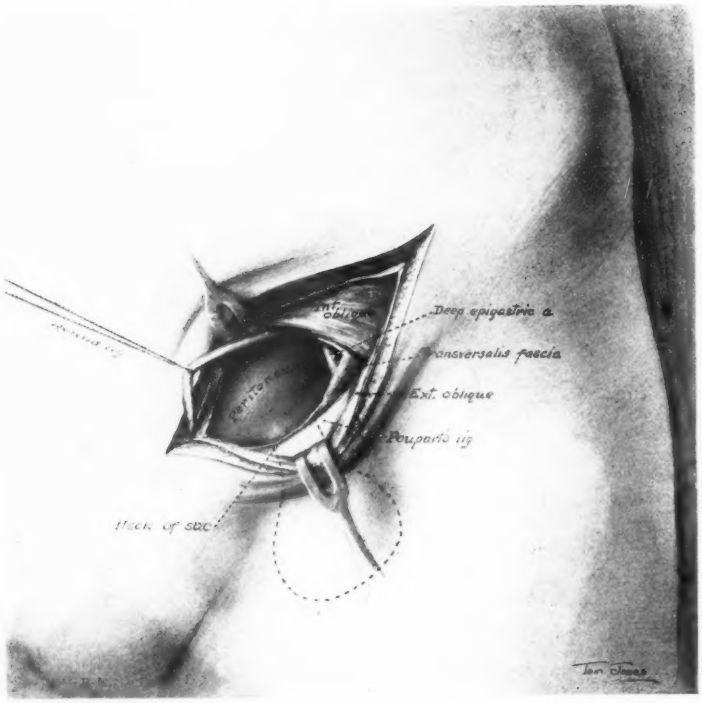

Fig. 2. Skin, subcutaneous tissue, external oblique and transversalis fascia have been incised and the upper and lower flaps retracted upward and downward respectively.

The fourth step consists in opening the peritoneum just as it converges to form the neck of the sac. Through this opening the hernial contents are pulled out of the sac, replaced in the peritoneal cavity and held there by a gauze pack, if necessary. If the intestine or omentum is strangulated, it may be liberated with ease by cutting Gimbernat's ligament, which forms the sharp inner margin of the constricting ring. Gimbernat's ligament is in full view, thus rendering it impossible to encounter uncontrollable hæmorrhage from an anomalous obturator artery. When one operates from the thigh and is obliged to cut Gimbernat's ligament blindly with a blunt pointed bistoury, one can never be sure that he will not encounter the so-called *corona mortis* (crown of death) formed by the anomalous obturator. If the hernial contents are adherent to the sac, one of two things happens: (1) Either the sac is *not* adherent to the tissues of the thigh (and it is almost the invariable rule that it is *not* adherent), in which case traction on the hernial contents pulls the entire sac out of its bed, converting the femoral into an inguinal hernia and thus enabling the operator to deal conveniently with the adhesions between sac and sac contents, or (2) the sac is adherent to its bed, in which case the inguinal incision is extended downward on the thigh, over the hernial protrusion, thus enabling the operator to dissect the sac free from its adhesions to fascia and cellular tissue.

Let us assume that we are dealing with a typical case. The fourth step has been completed, the hernial contents have been extracted from the sac and reduced into the abdominal cavity and we are ready for the

Fifth step, which consists in introducing a

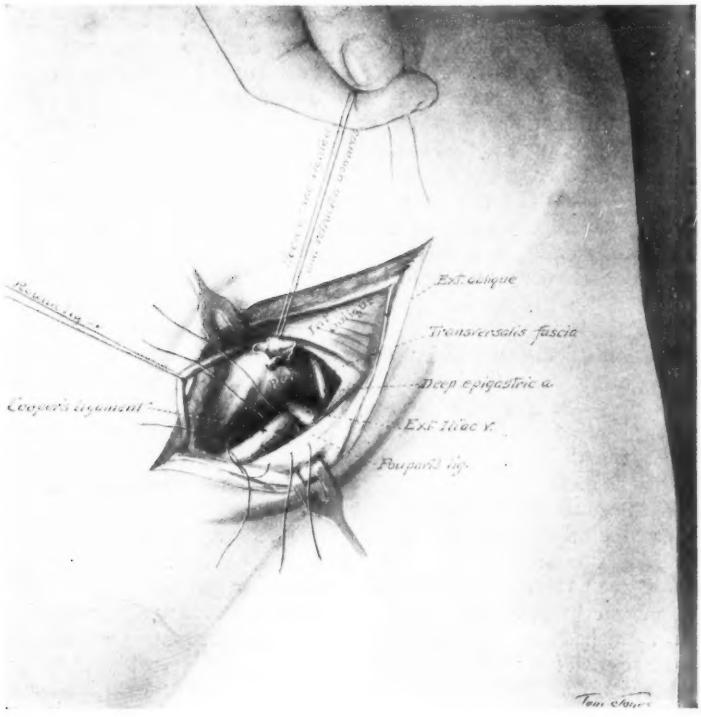

Fig. 3. The sac has been delivered, ligated high and amputated. The three chromic gut sutures for closing the femoral ring are in place, ready to tie.

dressing forceps into the sac, down to its lowest point, then closing the forceps and withdrawing it. This procedure everts the sac and converts the femoral into an inguinal hernia. The sac is now tied off by transfixion ligature or by suture and, as may be seen in Fig. 3, it is tied off with ease sufficiently high to guarantee absolutely against leaving a dimple, protrusion or any other variety of potential hernia behind. If the sac does not evert easily, we know that it is adherent to the bed in which it lies, and we must proceed to dissect it out by retracting the lower skin flap or by enlarging the incision as described above under the head of "fourth step."

The sixth step consists in closure of the femoral ring. The ring is exposed to full view by retracting the lower flap of the external oblique downward and outward and by retracting the skin, the upper flap of external oblique, the tendon of internal oblique and transversalis muscles and the transversalis fascia upward and inward (Fig. 3). The ring is bounded by the external iliac vein externally, by Poupart's ligament anteriorly, by Gimbernat's ligament (covered by a reflection from the transversalis fascia) internally, and by Cooper's ligament posteriorly. A detailed description of Cooper's ligament is furnished in the supplementary note at the end of our paper. It is sufficient to point out here, that when the parts are retracted, as we have described, one can palpate the horizontal ramus of the pubis and can see it covered by a dense, tough, white, glistening fascial membrane. This membrane is Cooper's ligament. With a small, full curved needle one takes a deep bite through Cooper's ligament (deep enough to go down to the periosteum of the pubic bone) just internal to the

iliac vein, and then another bite through the lower flap of the transversalis fascia and the edge of the Poupart's ligament. Another suture is similarly placed internal to the first one, and a third one still further internally, if necessary (Fig. 3). The most internal suture always picks up Gimbernat's ligament. When these sutures (we use chromic gut) are tied, they approximate Poupart's to Cooper's ligament and effectually close the hernial orifice. In placing the first suture the external iliac vein is protected against possible puncture with a small curved retractor.

The seventh and last step resembles the ordinary closure of an inguinal hernia. Chromic gut sutures approximate the internal oblique and transversalis muscles (including the upper flap of the divided transversalis fascia) to Poupart's ligament. We usually do not transplant the cord or round ligament. Finally the external oblique is sutured and then the skin incision is closed.

The operation as we have described it and as we execute it is practically indentical with the description furnished by Moschcowitz (loc. cit.). As the result of our experience we feel that Moschcowitz's enthusiastic recommendation of the operation is more than warranted[1] and that as regards rationality, simplicity and safety, this operation stands in the same relationship to femoral hernia that the Bassini operation does to inguinal hernia. In strangulated femoral hernia, requiring intestinal resection, the inguinal approach renders resection and anastomosis a comparatively easy procedure. There is never any need to consider, even for a moment, the supplementary abdominal incision, which is recommended by so many authors as a routine step in femoral hernia when resection is indicated.

SUPPLEMENTARY NOTE ON COOPER'S LIGAMENT

The inguinal attack on the femoral hernia has not come into more general use, largely because the various authors who have recommended the method have invariably emphasized the importance of Cooper's ligament, without devoting even so much as a line to its description. In closing the femoral ring, one is confronted with the necessity of suturing Poupart's ligament to Cooper's ligament and one is very apt not to know what Cooper's ligament is. If one attempts to inform himself, in the usual way, he finds that in Quain's Anatomy (first edition) the subject is not mentioned, in Cunningham's Anatomy (third edition) likewise no mention is made of the structure, in Morris' Anatomy (edition of 1907) the ligament is not described, and in Gray's Anatomy (edition of 1905) it is described most briefly in one place as "a strong ligamentous band," etc. (page 437), and in another place as "a small reflection from the tendon of the transversalis" (page 448). The average surgeon, in his own library, is not equipped to furnish himself with adequate information concerning Cooper's ligament. Indeed, one of the results of our investigation has been the discovery that even the anatomists are not in agreement.

In 1804 Astley Cooper published, at London, his classical work on "Anatomy and Surgical Treatment of Abdominal Hernia." In 1827 a second edition was edited by C. Aston Key. Copies of either of these editions are difficult to procure. Fortunately, however, in 1844, an American edition was put out by Lea and Blanchard at Philadelphia. This American edition is a verbatim copy of the second London edition as regards text. In this work on hernia, Astley Cooper for the first time described the ligament which now goes by his name.

A surprising and almost ludicrous phase of the subject is that one really cannot find Cooper's ligament in Cooper's own book, unless one has discovered in advance what the ligament is. By consulting the larger French and German handbooks or systems of anatomy, one finds that the ligamentum cooperi is, in reality, the ligamentum pubicum, and then if one goes through Cooper's work again he finds that on page 31 (American edition, loc. cit.) Cooper describes the os pubis as being "covered by a ligamentous expansion, which forms a remarkably strong production above the linea iliopectinea, extending from the tuberosity of the pubis outward, and pro-

[1] Moschcowitz very modestly lays no emphasis on a claim to having devised the operation, but his clear description should do much toward popularizing the inguinal attack on femoral hernia.

jecting from the bone over that line." Later he refers to this ligament as "the ligament of the pubes," thus establishing the identity of this structure with the "ligamentum pubicum." Of course, Cooper never utilized this ligament for closing a hernial ring, for in the days of Cooper, hernial rings were not closed.[1]

Cooper's own description, as we see, is not adequate, and it is necessary, therefore, to supplement it with the more detailed investigations of modern anatomists. The three best descriptions that I have been able to find are those by Poirier and Charpy, Testut, and by Eisler (in Bardeleben's Handbuch).

Testut (5) says: "The superior border of the pectineal crest is covered by a sort of fibrous cord, very thick, very dense, very resistant, intimately adherent to the bone, and extending from the spine of the pubis to the iliopectineal eminence. This is the pubic ligament of Cooper, or more simply termed, Cooper's ligament. The morphological significance of this fibrous structure, lying on the sharp, bony angle of the pectineal crest, does not appear to be clearly understood. Various authors describe the ligament of Cooper as a fusion, at the same point, of various fascial layers: pectineal aponeurosis, Gimbernat's ligament, Colles' ligament and the fascia transversalis, all of which find insertion into the pectineal crest. But the ligament of Cooper does not consist of these fasciæ alone, for it is made up also of other structures, of which the principal ones come from the lateral margin of the adminiculum of the linea alba."

Poirier and Charpy (6) furnish the following description of the ligament: "The iliopectineal line of the pubis marks the point of fusion of various fascial layers: the pectineal fascia, Gimbernat's ligament, behind this the posterior pillar of the external ring, and finally the transversalis fascia, re-enforced by the ligaments of Henle and Hesselbach. Thus the angular bony edge overladen by all these insertions is transformed into a rounded cord, which is given the name of the pubic ligament of Cooper — Cooper's ligament."

Finally Eisler, in Bardeleben's (7) extensive Handbook of Anatomy, describes Cooper's ligament as follows: "The fascia of the pectineus muscle (which covers the muscle as a thin fascial aponeurosis) changes at this point (i.e., the crest of the pubic ramus) into a strong, flat, tendinous cord, which runs parallel to the horizontal ramus of the pubic bone, finally reaches the ramus and projects over it. This cord, the so-called ligamentum pubicum (Cooperi) passes laterally and dorsally over the iliopectineal eminence and ends on the ilium. Mesially it extends over the mesial end of the horizontal ramus of the pubis, onto the superior surface of the body of the pubis. All of the structures previously mentioned furnish fibers to the ligamentum pubicum — (these structures are: tractus iliopubicus, falxinguinalis, ligamentum Collesi, ligamentum interfoveolare, interfoveolaris muscle, and the common aponeurosis of the obliquus internus and transversus) and in addition to these, there are fascicles from the adminiculum lineæ albæ, sometimes fibers from the tendon of the psoas minor and regularly, on the deep surface, fibers from the origin of the pectineus. As a matter of fact, we may assume, with safety, that Cooper's ligament is developed essentially from the pectineal fascia as a result of the varying pull of the different fibrous strands that radiate into it. Moreover, Cooper's ligament forms only that part of the pectineal fascia which is especially taxed by the above-mentioned pull."

It is evident from the above three translations that even the authorities on anatomy are not in complete agreement. The descriptions enable us, however, to orient ourselves very clearly regarding the gross anatomic relationships of Cooper's ligament. The important feature from the surgical point of view is merely this: When the ramus of the pubis is exposed by an inguinal incision, it is seen to be covered by a thick fascial bundle. This fascial bundle is Cooper's ligament.

[1] Cooper states quite naïvely that some surgical writers have actually proposed tying off the hernial sac, but that such an operation is not only useless, but also dangerous, due to the inflammatory peritonitis set up by the ligature. He quotes instances of death from suppurative peritonitis caused by ligating the neck of the sac.

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CONGENITAL DISLOCATION OF THE HIP; A RATIONAL METHOD OF TREATMENT[1]

BY HARRY M. SHERMAN, M. D., SAN FRANCISCO

WHAT I wish to say about congenital dislocation of the hip will be said from a purely clinical viewpoint. Clinically, then, we have to deal with a condition complex. This complexity includes a more or less incompetent acetabulum, a more or less imperfectly formed femoral head, a more or less shortened or distorted femoral neck, and a more or less elongated and narrowed capsular ligament.

The acetabulum is commonly shallow and lacking in its upper rim, in that the iliac component does not supply a broad overhanging mass to support the body weight on the femoral head.

The femoral head may be stunted, and commonly its ossific nucleus is displaced to a position external to the normal, and development must then result in an atypical head.

The femoral neck is, in most instances, of practical if not normal length, but it is, again, in most instances badly misdirected by a twist in the shaft, so that in the ordinary position of the limb the head is projected forward.

The capsule always has its normal attachments to the acetabular rim proximately and to the base of the femoral neck distally, but between the acetabulum and the femoral head it is elongated and therefore commonly contracted, so that its lumen is less than the diameter of the femoral head while its walls are thickened because of its reaction to the unintended work of having to support and carry the body weight in walking.

Of these potential complexities, that of the acetabulum, whatever it may be, is irremediable. The early operations which deepened the socket by excavation not only took away articular cartilage, but encroached upon epiphyseal lines and therefore interfered with growth. This practice was a phase in the development of a technique and has quite rightly been abandoned. We must take the acetabulum very much as we find it, but we may expect in some cases, after a successful reposition, a not inconsiderable amount of development along relatively normal lines from proper use of a hitherto unused part. Complete acetabular incompetence may be a cause of failure of reposition or of reluxation.

The femoral head belongs in the same class; no successful attempt has ever been made to remodel this part. In some instances a manifestly incompetent head has been ablated, but this has only robbed the patient of such poor support as the deformed head might have given, without offering the possibility of a substitute.

The femoral neck, commonly adequately long, is so frequently misplaced, by being directed forward, that it fails to correlate with the acetabulum. This distortion can be appreciated in the radiograms; for, if it be present, a radiogram taken of the hip with the toes of that foot pointing forward will show the neck and head obscured by the trochanter, or foreshortened. If now another radiogram be taken with the toes pointing inward (inward rotation of the limb through 90°), the neck and head will be seen in profile, and their practicability can be easily estimated (Figs. 1 and 2). The twist of the femoral shaft is the commonest cause

[1] Read before the American Surgical Association, Washington, D. C., May, 1913.

Fig. 1. Radiogram of a congenital dislocation of the hip, taken with the foot in the usual anteroposterior plane. The femoral neck appears foreshortened—apparently an incompetent part—not capable of proper articulation with the pelvis.

Fig. 2. Radiogram of same hip as in Fig. 1. Taken at the same time, but with the limb rotated in so that the foot is in a transverse plane and the toes point to the leg of the opposite side. The femoral head and neck come out in profile and the part is seen to be competent and capable of proper articulation with a competent acetabulum.

of reluxation, and of the inability to hold the femoral head in any better position than the so-called anterior transposition. In general, when the dislocated femoral head is found above the acetabulum, under the internal thigh rotator muscles, the femoral shaft will have the anterior twist; while if the head is found back on the dorsum of the ilium and shows there prominently when the child stands, the twist will not be present; but this is not an absolute rule.

The capsule and its elongated and narrow shape is the real obstacle to easy reposition. If its lumen is smaller than the femoral head it is impossible to thrust the head through it, for it is a very firm structure and not distensible. I base this statement on the fact that I have often thrust my finger down to its narrowest part, just at its attachment to the upper rim of the acetabulum, and I have sometimes—long ago—tried to dilate it with a powerful uterine dilator. It was always—except in one or two instances in which it was large—impassable to the finger, and the uterine dilator bent under the force applied but did not stretch the capsule. If this narrowest part be widened by an incision, the putting of the head into the acetabulum is an easy act, and commonly requires no force in children of the age best suited to the operation.

The operative technique proposed and practiced is as follows: In younger children, up to the age of five or seven, no preliminary treatment is needed. An incision is made from the anterior superior iliac spine downward, just external to the long head of the rectus femoris, between that and the tensor vagina femoris. This is the dividing line

between anterior crural and gluteal nerves, and none are cut, nor aught else but connective tissue, unless it be a small artery. The capsule over the displaced head is found lying just beneath the muscles mentioned. It is incised freely in the line with the incision already made. The hip is now flexed, which relaxes the capsule, and the gloved finger is inserted and passed into the capsule toward the acetabulum to the narrow part. A long-bladed straight probe-pointed bistoury is guided by the finger through the narrow place into the acetabulum. By pushing on the back of the blade with the finger inside the capsule, and making a to-and-fro motion with the holding hand on the outside, the capsule is cut downward through its lower part, so that the finger can slip along the knife into the acetabulum. This downward direction must be taken to avoid the femoral artery and vein. An ample opening of the acetabulum must be assured. Then, with the hip still flexed, guide and lift the femoral head over the rim into the cavity. At once extend the thigh, abduct it 70 to 75 degrees and rotate it inward 90 degrees—then flex the knee. This makes the long head of the rectus tight, and it lies just over the femoral neck in its new position and prevents anterior reluxation, and at the same time gives the plaster of Paris splint a much more efficient control of the femur, but it does put the limb in an awkward position. I formerly used to suture the capsule. Now I do not; the capsule at the outer side of the incision is carried downward and inward by the neck as it moves with the head into the acetabulum, and passes beneath the inner part of the same. The patent incision is an excellent drainage for the joint cavity, and when healing has occurred the reduplicated capsule is strengthened by the act. The opening in the fascia lata I suture with catgut and the skin with horsehair. The limb remains in the original plaster of Paris splint, which is a double spica, four or six weeks. Radiograms check up the accuracy of the reposition.

At the end of the four or six weeks the plaster is removed. Now, if there is a twisting of the femoral shaft, turning the head forward, I drive, while the limb is still held in inrotation, a long nail into the femur between the trochanters. Then I do a subcutaneous osteotomy just below the nail. Next, holding the upper fragment in the proper position by means of the protruding end of the nail, so that the head is in the acetabulum and the trochanter is in the normal transverse plane, I rotate the lower fragment out, so that the toes point a little (15 to 20 degrees) outward. Then another double spica of plaster of Paris is put on, and in this the end of the nail is buried so that the inward rotation of the upper fragment is maintained (Fig. 3). The reposition and osteotomy and the position of the fragments are again checked up by a radiogram. The nail remains *in situ* four to six weeks. The spica is undisturbed until the femur has healed and is firm. Splints, spicas of plaster of Paris, are put on at intervals for eight to twelve months, each succeeding one being a little shorter, and

Fig. 3. Radiogram of a replaced hip, the head in the acetabulum, the nail holding the head and neck in a transverse plane, the line of the osteotomy of the shaft and the whole held by the plaster of Paris spica.

with each the limb being put in less abduction. Walking begins in the splint about two and a half to three months after the osteotomy.

With this plan I *know* I have put the femoral head *into* the socket of the acetabulum and not on it with the capsule interposed. A proper intimate contact of femoral and acetabular cartilages is secured. This for the first stage, which overcomes the obstacles of the capsule. The second stage puts the femoral head and neck into a proper relation both with the femoral shaft and the acetabulum, so that when the foot is in the correct anteroposterior plane the vertical plane of the neck and head is directed inward and a little forward, and the head enters the acetabulum properly so that the posterior side of the neck is not in contact with the posterior lip of the acetabulum. This lessens the likelihood of reluxation, and if the patient has but a practical head and neck and a competent acetabulum, reposition will be stable and function will be satisfactory.

The evolution of the plan is simple. The stiff hips following the earlier operations in which the acetabulum was deepened led me to try the manipulative method. The instability of reduction in one instance made me, immediately after the manipulative reduction, incise to find out what was the difficulty. I found bunched up capsule between the head and acetabulum. When this was cleared away and the head really entered the socket, reposition became stable. Next, I noticed—in cases thus treated—reluxations after a few months or years, and referring this to the known distortion of the shaft, I adopted the practice of the osteotomy.

There is another danger which has been avoided by this particular technique, though its imminence was not appreciated until very recently.

I had noticed an interference with growth, following the deepening of the acetabulum, in the case of a young woman upon whom I had done the original Lorenz operation when she was a little child. This operation, as you remember, deepened the shallow acetabulum. The reposition done on the child was stable, but she had a progressively increasing shortening of the limb during her years of growth. A radiogram, taken when growth had been obtained, shows the acetabulum at too high a level on the side of the pelvis, just as the acetabulum comes to be too highly located in the cases of hip-joint tuberculosis with involvement of the acetabulum and destruction of the epiphyseal line of the iliac component. Evidently the excavation and deepening of the acetabulum in the old type of operation interfered with epiphyseal lines and checked the normal downward growth of the iliac component of the socket.

With this technique of reduction through an incision, which really reduces, and osteotomy when it is necessary to fit the component parts of the joint to each other, I feel I can give my patients a full 100 per cent of their chances for a practical joint. I cannot recreate bony deficiencies, nor perfectly fit together wholly mismatched parts, but with a practical acetabulum and a practical head and neck I think the method should give a practically normal joint. A joint is a mechanical contrivance, and the test of its mechanical competence is its functional competence. A joint which has a functional competence equal to that of a normal joint is itself a normal joint. In many instances the radiogram may show variations in shape, size, and other details from the generally accepted form, but if the function is equal to that of a normal joint I claim that it is a normal joint.

As regards statistics: There have been twenty-nine hips reduced by incision with no osteotomy following. Of these, eight have gone into the position called anterior transposition. Three have stable reposition, but have developed coxa vara. One has, with no demonstrable infection, become completely ankylosed. In one, an infection of the incision caused death. Four we do not know about. Twelve have functionally normal joints.

This is 41.3 per cent of success.

There have been twenty-seven hips reduced by incision with an osteotomy following to correct a twisted femoral shaft. Of these, two have gone into anterior transposition because of incompetent acetabula. In two, the nail failed to hold the upper

fragment after the osteotomy, and the parts returned to their original relations. These cases were then as if no osteotomy had been done. In one instance, I must have encountered some osseous dystrophy, for the femur crumpled up in a simple and forceless manipulation, and though the reposition is stable, the alignment of the shaft is erratic, and will need correction later. Three are still under treatment. Nineteen have functionally normal joints.

This is 70.3 per cent of success.

TUMORS OF LARGE NERVES ASSOCIATED WITH FIBROMA MOLLUSCUM, WITH EXHIBITION OF LARGEST SPECIMEN ON RECORD[1]

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THE writer's interest in this subject is largely due to the enthusiasm of Dr. Carl H. von Klein, who was kind enough to furnish him with a complete bibliography of the subject, and this fact seems sufficient reason to make this paper of sufficient value to present to this society.

There is so much literature on the subject that only a few salient points will be dwelt upon in this paper, and anyone who may be interested further can refer to the bibliography.

The first well-described morbid condition of neuroma was written by Paul Aronson in his work entitled "Pathologie des tumeurs," in 1788, where he relates his observations and describes tumors composed of nerve fibers. F. X. Alexander, in a dissertation in 1800, speaks of such tumors developing either in the neuriline or in the nerve. These tumors were known under the name of nodular nerve tumors, tubercular nerve tumors, scirrhous nerve tumors, ganglion tumors, elephantiasis, and so forth.

Odier of Geneva, in his work entitled "Manual de Médécin Pratique, 1803," first introduced the term "neuroma," and describes a case of a species of aneurism of the radial nerve, and says all the nerve fibers spread fan-like from one another, or, like the ribs of a melon, their center is filled with a whitish matter and in some places yellowish; it is spread out in intervals of an infinite number of transparent vessels interlaced with one another. This description, says the great pathologist Virchow, evidently refers to a case of myxoma; he further says that every tumor has an organic, a morbid, or a normal structure; this defect can exist in the neurilemma, in the marrow of the nerve, in the arteries, in the veins or lymphatics of the sheath, or finally in the nerve substance itself. This essential point has induced Odier to term it neuroma. He also used the term neuroma for morbid tumors, circumscribed and deep, which are caused by accidental swelling of a nerve and at the extreme stage of which the tumor causes very severe pains.

In Hyde's eighth edition "Diseases of the Skin," which I understand was written by the late Dr. H. G. Anthony, fibroma molluscum is stated to be a developmental defect manifesting itself by the presence of tumors of the skin and other organs of the body, pigmentations of the skin and mucous membrane of the mouth and by defect in the mental development; one or both of the last two named symptoms may be absent.

Symptoms. The tumors are usually numerous and scattered irregularly over the entire body. They are from pea to egg sized and vary greatly, according to their age and dimensions. In early development they present dome-shaped pea to bean sized elevations which are softish, semisolid, or pasty with a normal epidermal covering. Later they are cone-shaped, semisolid formations, sometimes capped by an opaque summit

[1]Complete bibliography may be obtained by writing to the author.

which presents the appearance of a vesicle and which bleeds freely when pricked. Digital compression causes these tumors to disappear through a ring in the skin and when released, they spring back into their normal position. Old tumors are less gelatinous, are firmer, mammillated, often pedunculated. Small sized tumors may recede leaving an empty pouch of skin. When egg sized, the tumors are usually subcutaneous and are less lobulated than fatty tumors; when diffuse, especially in the face, they draw the skin into extensive folds—fibroma pendulum.

Occurring about the anus they present folds of tissue which resemble labia minora vulvæ and which annoy the patient in defecation. They are not painful when touched and they produce no subjective symptoms. In a given case tumors of all sizes and in all stages of development may be present. When very large, there may be a single tumor present which may be more or less pedunculated. The tumors may affect the mucous membrane of the mouth, large nerve trunks, suprarenal capsule, intestines and other internal organs. Patches of leucoderma, telangiectasia, patulous orifices of sebaceous glands, comedones and fatty tumors are not uncommon. Pigmentations are usually light to dark brown colored, freckles sprinkled over the entire cutaneous surface together with a few large patches of pigmentation; jet black points of pigmentation are sometimes observable in the larger areas. The freckles may be discernible in the negro.

Rolleston enumerates about ten conditions which seem to influence the congenital factor by increasing the lesions, viz., (1) trauma; (2) extreme cold; (3) chronic irritation of the skin; (4) physical influences; (5) overwork; (6) puberty; (7) pregnancy; (8) menopause; (9) infectious diseases. The large number of contributary influences given by this last named author seems to be an index of the lack of real knowledge of the etiology of this disease and the pathology as yet described is not very clear; however, Soldan gives the following conclusions:

First: The pigmented nævi are in the majority of cases the first symptoms of a fibromatous process in the connective tissues of the cutaneous nerves.

Second: The pigmentation is probably a result of the fibromatosis of the nerve connective tissue.

Third: The nævus cell nests and strands, as described amongst others by Unna, are neither epitheliomata nor lymphangiofibromata but neurofibromata.

Fourth: From the fibromatous process of the pigmented nævi develop dermoid tumors which are described as soft fibromata and elephantiasis mollis.

Fifth: The fibromatous process is not only confined upon the skin but may also appear on any place of the peripheral nerve system and may also lead to the formation of so-called pseudoneuromata and plexiform neuromata.

Sixth: The variety of forms of neurofibromatosis is caused by localization, anatomical conditions and energy of growth of the elements of the tumors.

We have to differentiate, therefore:

1. Neurofibromata of the larger nerve trunks, as far as they still show a distinct perineurium.

To these belong:

(*a*) Pseudoneuromata (fibroneuromata) characterized by the localized proliferation on single points of the nerve.

(*b*) Neuromata plexiforma. The proliferation attacks larger areas of the nerves equally.

2. Neurofibromata of the nerve end distributions after loss of the perineurium.

(*a*) Cell nests and strands of the nævi pigmentosi, verrucæ carneæ or mollis, fibromata mollusca, characterized by circumscribed proliferations in the skin.

(*b*) Elephantiasis congenita neuromatodes, pachydermatocele elephantiasis mollis, diffuse proliferation in the area of the distribution district of one or several larger nerve trunks of the skin.

Francini says: "In the nerve fibers and at any portion of their course the regression of the segmental elements of which they consist may take place for reasons hitherto unknown; by extensive proliferation they give rise to the formation of tumors, which in their construction reproduce distinctly the different stages through which the segmental cell passes to its complete differentiation."

As this is the case with other tissues, there also exists here a very distinctly perceptible parallelism between the various neoplastic forms and the structural changes, which may occur under other conditions of the increased activity in the nerve tissue. This conformity of facts can be easier studied between the true neoplasm and the amputation neuroma, which latter, though not of purely neoplastic nature, must from its histologic standpoint be counted among the myelinic neuromata because the picture that we obtain from them is in the most minute details equal to that which certain tumors that develop in the continuity of a nerve trunk may show.

The genuine tumors, supposing even the possibility that new formations of connectival origin may occur in the nerves, show the greatest variety of histologic symptoms, so that one is forced to presume the segmental nature of the same.

This perception is easier in tumors whose tissues correspond with earlier forms than those of the grown and normal nerve fibers.

A thorough examination may, however, in forms with absolutely embryonal characters and in those in which metamorphoses of various types develop, reveal the development of the new formation tissue from the nerve fibers which are in an extreme stage of cell regression.

The knowledge of the diffuse, congenital, and hereditary neuromata is more in conformity with the conception of the neuroplastic nature of these tumors than with the conception of a connectival origin, and on the other hand the localization of the changes upon few nerve bundles, whilst the others continue their way upon the periphery of the tumor, may make the study of this connection of the new formation with the connective tissue difficult.

The study of nerve tumors when performed systematically and leaning upon the knowledge which anatomy, embryology, and the experimental pathology of the peripheral nerve system have given to us, whilst it permits us to perceive all the deviations from the normal evolution which may occur in a nervous tissue, forms a tract which is worth while to be intimately followed and which may give us important results concerning the origin of the nerve fiber and its inner structure.

Von Recklinghausen, in 1882, gave such a good description of this disease that it bears his name.

From the local profession in Chicago we were given very interesting reports by Drs. R. B. Preble, L. Hekton and William Healy which show what a great variety of morbid conditions may accompany this disease.

There are four general divisions in the

symptomatology: tumors of the skin, tumors of the nerves, pigmentations of the skin and functional disturbances, which have been emphasized by Dr. Preble in his discussion of his remarkable case.

The writer's case is of interest because of the large size of the tumor which was removed from the left sciatic nerve January 29, 1912, at the Chicago Policlinic Hospital.

The following is the history:

E. Z., age 22, female, single, saleslady, previous health good. Family history negative so far as this disease is concerned. About seven years ago she was struck on the back of the lower third of left thigh by some one's knee while at a dance. No attention was paid to this until about a week later, when a swelling was noticed which grew slowly until at present it appears to be the size of a cocoanut, is of solid consistence, slightly movable in all directions when the posterior muscles of the thigh are relaxed, but fixed when they are held tense. There is no particular enlargement of the superficial veins and no disturbance of nerve function, except during the last four days, during which she has experienced a moderate amount of pain in the growth. Upon cutting down upon the growth it was found to involve the sciatic nerve and measured six inches in length by three in diameter and weighed one pound and three ounces. Dr. John A. Graham of the Policlinic Laboratory reported the tumor to be a fibroma.

In reviewing the literature, the writer found that several authors dwelt on the fact that the new growth of nerves is apt to displace the nerve fibers outward so that they may surround the growth or the growth may be, as it were, forced through one side, but in this case it was noticed that several fusiform enlargements about three-fourths of an inch long and one-quarter of an inch in diameter appeared on nerve bundles extending downward into the middle of the nerve trunk so that it was impossible to remove the growth without destroying nearly if not all the nerve fibers of this very important nerve trunk. The time since the operation has been too short for evidences of regeneration to show themselves on account of the great length of nerve trunk which was removed.

The photographs herewith presented were very kindly taken by Dr. D. C. Hoyt, and Dr. James C. Gill was also kind enough to examine the case for me twice since the operation with reference to its neurological findings.

CYSTS OF THE OMENTUM[1]

With Report of a Case

By V. A. FUNK, A. B., M. D., Vincennes, Indiana

THE more frequently a pathological rarity is encountered, the more it is circulated through our current literature of to-day, and the more thoroughly it is discussed before our gatherings; which is the only way in which the whole profession can expect to familiarize ourselves with the condition, while the different phases of the subject are slowly thrashed out, until a more or less settled idea of the same becomes general. Such has been the career of each pathological finding as it has presented itself before the scientific men of our profession, and while many obscure conditions have been brought out of the darkness, we know too well that too many are still far from being on a perfect understanding basis. In the latter class we must place the cysts of the omentum.

When we consider that only thirty-eight cases of cysts of this tissue have up to the present time been placed on record, we can easily understand how very rare the condition is, and we are not surprised when we search some of our journals from their first publication to the latest issue, without finding a single article upon the subject. Some of the cases reported are so indefinite that very few conclusions can be derived from them. The condition was first described in 1851, by Gairdeur.[2]

Cysts of the omentum are exceedingly interesting from two standpoints. First, we will consider the origin and pathology, which may be termed the scientific side. From the cases reported, they have been classified as follows: Embryonal, which is advanced mostly from the fact that these cysts usually occur in childhood, fifty per cent occurring before the age of ten and sixty-five per cent occurring before twenty-one. Hearns[3] reports a case of a boy, eight years old, who had a fluctuating tumor at birth which decreased in size for a while, but again enlarged and was aspirated at the age of four years. Upon refilling, an omental cyst was removed four years later. Nearly all observers believe some of the cysts to be embryonal in origin, claiming we can have embryonal rests here as well as in any other part of the body. The echinococcic origin has never been proven in the pathological laboratory. Lymphatic originating from either the vessels or nodes has held much favor. Rokitansky ventured to make the assertion that all omental cysts were of this origin, terming them as either dilated lymphatic vessels or dilated lymph nodes. Hæmorrhagic origin for four of the above cases contained coagulated blood, and eighteen contained a dark fluid, which from all appearances was partially blood at some time. Dowd[4] reports a case of a man aged twenty-six with an omental cyst, with a pedicle made up of twisted omentum, the origin of which he thought was as follows: Hæmorrhage from some cause into the omentum forming a hæmatoma. Absorption of the hæmoglobin and degeneration of the blood cells followed by torsion with œdema and transudation of the watery elements of the serum into the cyst's cavity. Fort's[5] case of a boy two and one-half years old contained dark bloody fluid. The case which I will report later, I am inclined to believe had its origin from an embryonal rest, because it had a definite capsule and the fluid was negative and as perfectly clear as spring water.

The pathology varies greatly in the different reports. The contents have been lymph, chyle, serum with and without the presence of blood cells, dark fluid containing coagulated blood, and clear watery fluid. Very few have contained a definite capsule, most of them separating the folds of the omentum with no further encapsulation whatever. They have also been reported as being outside the

[2] Tr. Path. Soc., Lond., 1851.
Quoted by Van Hook and Kanavel in Keen's Surgery.

[3] Ann. Surg., Phila., 1911.

[4] Ann. Surg., Phila., 1903.

[1] Read at the Second District Medical Association of Indiana, Washington, D.C., September 4, 1913.

omentum and attached by thin adhesive bands, which fact led Phillips[1] to suggest that these might have had their origin from the ovary, and by twisting of the pedicle were detached and continued their existence by receiving nourishment from the omentum. When the cyst has a definite wall it is held to the omentum, which usually forms a second or outer wall by light adhesions, and is nourished by vessels running directly from the omentum. When the cyst becomes extremely large, adhesions will be formed between the omentum and parietal peritoneum due to the pressure. Two dermoid cysts have been reported by Waldy[2] and Wells.[3]

The most interesting part of the subject is from the practical standpoint, which includes both the diagnosis and treatment. The fact that only two cases out of the above number were diagnosed before operation emphasizes the weakness of our diagnostic ability in these conditions. Pean[4] holds three points as of paramount importance in the diagnosis of omentum cysts: superficial location; abnormal passive mobility with the downward movement limited; and absence of functional disturbance. These points would aid us only before the growth had reached any great size, for when the abdomen has become completely filled with the tumor and is adherent to the abdominal wall, as in the case I am reporting, the location is not diagnostic; there is no mobility whatever, and we usually have dyspnœa, palpitation, indigestion, and constipation due to the pressure.

When the cyst is not large, the location at the umbilical region and above the intestines, with free motion in each lateral direction and upward, but only to a limited degree downward; not disturbed by the respirations; not causing the patient any disturbance whatever; the general health being perfect and the tumor slowly getting larger, would be very suggestive of an omental cyst, and I think a diagnosis should be made from the above picture if seen at the proper time.

Several observers have reported pain, which radiated toward the liver. Vomiting and diarrhœa alternating with constipation, and cachexia have been noted in extreme cases. Palpation reveals a movable fluctuating growth, which is pathognomonic of cystic growth of the abdomen, the only exception being a lipoma which sometimes fluctuates. Pancreatic tumors, while having their location in the umbilical region, usually occur later in life and give constant pain and if malignant produce fatty stools and icterus. Mesenteric cysts usually have a coil of intestines between the tumor and the abdominal wall with a lessened area of mobility. This condition has been conflicted with ascites, lipoma, aortic aneurism, cysts of the liver, pancreas, urachus and tubercular peritonitis.

The treatment may be summed up in a single word — removal. Tapping, which is always a very dangerous procedure when dealing with abdominal conditions, will only relieve, and the cyst is sure to refill. Hearns tapped his case but was compelled to operate later. Fort aspirated, not for a palliative remedy, but because he was afraid to release the great hydrostatic pressure from the splanchnic vessels suddenly, so he removed about five pints of the fluid and operated five days later. Matthews[5] cites a case of a boy, eight years of age, who was tapped four times with a refilling each time, and the condition of the patient becoming worse. The puncture through the cyst wall may remain patent and peritonitis follow from the leakage. If the cyst has a definite capsule, it can be freed from its adhesions, and removed *in toto*. Should there be no cyst wall except the omentum itself, that portion forming the cyst can be removed. If there is a pedicle formed either from an adhesion or a twisting of the omentum, this can be tied off and the tumor removed. With a recovery of 86 per cent of the cases reported, we need not fear the radical operation, as it is the only means of a cure. These cysts confront the surgeon when he least expects them, and a very great mistake indeed might be the outcome in the hands of an inexperienced operator.

CASE 1. The patient, a girl aged seventeen, entered the Good Samaritan Hospital, July 7, 1913. Her family history was negative. The past history was

[1] Kings' Hosp. Rep., Lond., 1896.
[2] Lancet, Lond., 1889.
Brit. M. J., 1890.
[4] Quoted by Van Hook and Kanavel in Keen's Surgery.
[5] Brit. M. J., 1905.

good with the exception of pneumonia, which kept her in bed two weeks. This occurred three years ago, following which she first noticed a slight enlargement of the abdomen. The abdomen has slowly grown larger since that time. From the beginning of the growth, which they thought was never localized, but general, she had no symptoms whatever, until the summer of 1912, when she was confined to bed two weeks with severe pains in both inguinal regions, radiating to the back only. The pain was most severe on the right side. She had two or three chills followed by fever, none that she knew of at any other time during her trouble. After getting out of bed she could not straighten up for several days. Urination too frequent at this time, but normal since. A slight leucorrhœa was present while in bed, but stopped a few days afterwards. Bowels have been constipated since she first noticed the trouble, requiring purgatives constantly. The periods begun at the age of thirteen, and have always been regular and normal, except at this last attack, when she missed three or four months, following her confinement to bed. The patient the last three years had taken cold easily, with hoarseness, which held on unusually long, but she had no cough between them. The abdominal pains had totally disappeared the last six months. There had been very little increase in the abdomen the last eight months. On examination, the patient was very much emaciated. The abdomen was as large as a nine months' pregnancy. The whole abdomen was distended and a distinct fluctuation wave could be felt from any angle across the abdomen. The percussion note was dull with the exception of two small areas at either side of the lumbar spine. Changing her position did not alter the percussion note, due to the abdomen being so tightly filled with the tumor. Vaginal examination was negative. The temperature did not go above 99° F. The W. B. C. was 8,000, reds 4,000,000, hæmoglobin 80 per cent. The urine was normal. The only symptoms she complained of were shortness of breath and palpitation on exertion. A diagnosis of tubercular peritonitis was made with a probable origin at the appendix or Fallopian tube. On opening the abdomen the fluid was found to be encapsulated. I then thought it to be an ovarian cyst, as they are the more frequent, but on examination the tubes and ovaries were normal, and the tumor had no attachments in the pelvis whatever. I then decided to drain the cyst to make room in the abdomen for further examination. On cautiously going through the cyst wall, it was found to be made up of two distinct layers, the first a very vascular layer, which proved to be the omentum, and the second a fibrous layer, which was the capsule proper. After evacuating over three gallons of perfectly clear fluid, the cyst wall was easily removed from its omental bed, by dry dissection, there being only five or six nutrient vessels which required ligation. The tumor had no pedicle whatever, nor were there any strong adhesive bands connecting the cyst wall to the omentum. The omentum completely enveloped the cyst. The pathological report, which was made by Dr. Wm. Litterer of Nashville, Tenn., was as follows: Nothing could be found to give a clue as to the origin. The wall was quite regular in thickness and consisted only of fibrous tissue. Internal to the capsule was a single row of cells, responsible for the secretion.

The patient made an uneventful recovery and left the hospital eighteen days after the operation.

PNEUMATIC RUPTURE OF THE BOWEL

By P. A. BENDIXEN, M. D., and J. D. BLYTHING, M. D., Davenport, Iowa

PNEUMATIC rupture of the bowel is a condition in which the bowel is inflated through the rectum by means of air under high pressure, with resulting rupture of the viscus, intra-abdominally.

The case that came under our observation is that of Paul Magdal, age 20, laborer, single, Austrian by birth; admitted to Mercy Hospital December 21, 1912, at 3:30 A. M.

Examination of patient on entrance to hospital: Patient conscious, face a little sallow and cyanotic, gasping for breath; facial expression was anxious and pinched. Enormous distention of abdomen, skin very tense; abdomen very tympanitic. Patient had very little, if any, abdominal breathing. Temperature, 98.4°. Pulse, 114. Respiration, 38. Patient was nauseated and vomited some greenish-colored material. Complained of severe griping in abdomen. Patient more comfortable lying on right side. Legs flexed on thighs, and thighs on abdomen.

Diagnosis. The diagnosis of pneumatic rupture of the bowel in this case was easily made, for the reason that a clear history of the accident was given.

Operation. Patient was given morphine gr. ¼ and atropine gr. 1/130 per hypodermic, before operation. Laparotomy was done about two hours after the accident; median line incision was made from about an inch above the umbilicus and extending almost to the symphysis. There was a little soiling of the peritoneum at the seat of a perforation on transverse colon near the hepatic flexure, and considerable amount of bloody serous exudate in the free abdominal cavity. The bowel was enormously ballooned, very little air having escaped into the free abdominal cavity. The serosa was much reddened and showed a considerable amount of injection; the sigmoid colon was ruptured along the convex border for a distance of about seven inches, with a gaping tear in its serous and muscular coats, through which the mucous coat bulged; the peritoneum was more or less ribboned throughout the entire length of the tear. The laceration on the sigmoid for the first two or three inches was virtually in a fixed part of the gut. There were three lacerations ranging from two to four inches in length on the descending colon; one large laceration about six inches long was found on the transverse colon near the hepatic flexure; in the center of this laceration we found a small perforation of the bowel. Four lacerations ranging from one to four inches were found on the ascending colon; two lacerations about two inches in length were found on the ileum about 8 inches away from the cæcum. A laceration of about 3 inches was found in the mesentery near the junction of the ileum with the cæcum, and a large blood clot was removed from the mesentery at this point. The entire colon was very much congested and more especially about the cæcum. A large number of hæmorrhagic areas, varying in size from one-fourth of an inch to three-fourths of an inch, were found in the small intestine. There was no regularity in the outline of the hæmorrhagic areas.

Technique of operation. All of the lacerations of the bowel were sutured with plain catgut. At the seat of the perforation on the transverse colon, plain catgut was used; here, however, we had to make a slight inversion of the bowel on account of the extensive laceration, and a reinforcement was made by a row of Lembert's sutures.

After tying off a few small vessels, the rent in the mesentery was likewise sutured with plain catgut.

After having examined the entire intestinal tract, the abdomen was closed, layer by layer, without drainage. Two deep silkworm gut tension sutures, over gauze rolls, were introduced. The time of the operation was one hour and thirty minutes.

After-treatment. Patient was put to bed and placed in Fowler's position. Normal saline solution was given per rectum by the drop method, one pint every four hours for the following thirty-six hours. It was necessary, however, to interrupt the saline twice during this time on account of the accumulation of gas in the intestine. On each of these occasions the administration of a turpentine and glycerine enema sufficed to bring away a large amount of flatus and the saline was then resumed. Patient was allowed to drink as much water as he desired.

On the same day at 1 P. M. the patient's temperature was 99.8°; pulse, 100; respiration, 30. The temperaturen ever exceeded 100° nor the pulse 100. This man made an uneventful recovery and left Mercy Hospital on January 3, 1913, or 14 days after the accident.

Cause of accident. The accident in this case was caused in the following way: the patient, a molder for one of our large foundries, had completed his work and while waiting for the furnace heat, fell asleep; a co-employee jokingly placed a compressed-air hose near his rectum and then turned on the compressed air. The air pressure at this time was estimated to be from 100 to 125 pounds. The air was forced through the clothing. The patient was immediately stricken by his internal injuries and was unable to walk after the accident.

In reviewing the literature on this subject, we found that very little has been written on

this form of injury. The only complete article was that of Dr. E. Wyllys Andrews, on "Pneumatic Rupture of the Intestine, a New Type of Industrial Accident."[1]

Since the publication of Dr. Andrews' paper, we have been able to collect seven additional unpublished cases, including our own.

CASE 1 (unpublished). History given by Mr. G. A. Orth, Chief Adjuster of the American Car & Foundry Company. Accident happened at Berwick, Pennsylvania, August 18, 1908.

Cause of the accident. The man, while working in the sandblast house, was held fast by two of his fellow-workmen, while a third employee applied the compressed air to his rectum. The victim was immediately seized with fearful griping pains in the abdomen. Patient was taken to the Berwick Hospital, where he was operated upon at once for pneumatic rupture of the bowel. Patient died three hours after the accident. Direct cause of death not given.

CASE 2 (unpublished). History given by Mr. G. A. Orth, Chief Adjuster of the American Car & Foundry Company. Accident happened at Milton, Pennsylvania, June 28, 1913.

Cause of accident. The compressed air in this case was applied, in a joking manner, to a boy, age 16, by a man. It was estimated that the air pressure in this case was about 85 pounds, the dial showing the record of the air pressure for that day in the power house to be about 100 pounds. During four or five short periods, the pressure was down to 85 and 90 pounds. The hose in this case was some distance from patient. The extent of the injury in this case was not serious and the boy returned to work shortly after the accident.

CASE 3 (unpublished). History given by Mr. R. C. Richards, General Claim Agent of The Chicago & Northwestern Railway Company. Eugene Dagenais, age 15. Date of accident, March 21, 1906, at the Chicago Railway shops.

Statement of party who applied the compressed air hose: "I was polishing some brass with a buffing wheel and I asked Eugene Dagenais to apply the air hose to me and clean my clothes, which he did; and then I served him in the same way. While placing the head of the air hose in between his legs, I must have applied it too close to his rectum, because he immediately bent forward and complained of pain. He then went to the closet downstairs, after which he went home. I have not seen him since. I did not push the head of the power air hose through his trousers, and I had only one-half of the power turned on. I do not know how many pounds I applied, but it was not very strong. We were not fooling."

In this case the boy went home on March 21, 1906, and was treated by Dr. B. of Chicago, until March 24, 1906. Patient was admitted to Francis Willard Hospital on March 25, 1906, at 8 A. M. and was operated on by Dr. A. P. H. Patient died March 25, 1906, in Francis Willard Hospital.

Post-mortem findings by Coroner Warren H. Hunter, on March 26, 1906, at Cook County Hospital: Peritoneal cavity filled with blood, fæces and a yellowish fluid. In the large intestine about 8 inches from the rectum, a linear tear, one inch long, was found. Cause of death: peritonitis and shock following external violence.

CASE 4 (unpublished). History given by Mr. Robert B. Kay, Claim Agent of The Hudson & Manhattan Railroad Company.

Accident happened at the Fifteenth Street shaft, New York, in 1905. In this case, the injured man's abdomen was ballooned by having an air hose closely pressed against his rectum. Patient received a pneumatic rupture of the bowel. Recovery was rapid and complete.

CASE 5 (unpublished). History given by Dr. J. A. Denney, Medical Director of the C. B. & Q. R. R., Chicago, Illinois. Accident happened on the C. B. & Q. Railroad.

The victim in this case was working in a bent-over position and a fellow-employee who was handling an air hose, in a spirit of mischief, pushed the air hose violently against the victim's rectum, allowing the highly compressed air to escape into the bowel. The injured man, in this case, died soon after the accident.

CASE 6 (unpublished). History given by Dr. H. C. Groman, Surgeon for the Standard Steel Car Co., Hammond, Indiana.

Patient, a boy, age 15, was injured in the Standard Steel Car Co. plant at Hammond, Indiana. The accident in this case was caused by a compressed air hose being placed to patient's rectum in a joking manner. Full pressure of compressed air was applied. The patient's abdomen was enormously distended, pain severe and continuous, pulse very rapid, heart showed signs of collapse, patient became pulseless, lost consciousness, respiration ceased and he was pronounced dead by the interne and another doctor, while Dr. Groman was introducing a rectal tube. When patient showed the above signs of collapse, Dr. Groman carefully introduced a trocar through abdominal wall and allowed the air to escape, but care was taken not to allow the air to come too rapidly in order to prevent any possible chance of a reaction.

Dr. Groman, in his communication, states the above procedure brought patient back to life, respiration returned, heart sounds and pulse improved, consciousness returned.

A laparotomy was immediately decided upon, patient was anæsthetized and the usual incision made. When the incision was made through the

[1] Surg., Gynec. & Obst., 1911. January. In this case Dr. Andrews reports a case of his own and gives a collection of 15 other cases.

abdominal wall, more air escaped from the free peritoneal cavity.

The peritoneal cavity was filled with a serous, bloody exudate, and particles of fæcal material were found. The peritoneum was ruptured in nearly every conceivable point; there were very few ruptures of the intestinal wall, the muscular layer was torn in some instances, but the serosa was extensively torn. The main laceration was near the cæcum.

Operation. The lacerations were sutured, and abdominal incision was sutured. Drainage tube was left in abdominal cavity.

After-treatment. Efforts were made to combat shock, but patient died four hours after operation.

Now, in taking up the subject of pneumatic rupture of the bowel, we note that all of these cases are the results of initiations, hazing, or carelessness on the part of the workmen with the compressed air hose. It is evident that this practical joking must be common and it is very probable that many more minor or trifling accidents have happened which are not reported. In all of the cases cited in this paper, the air had to pass through one or more layers of cloth to enter the anus. Yet this obstruction did not seem to delay its destructive or deadly work. In several cases reported by Dr. Andrews, and in some of our cases just reported, it will be noted that the compressed air nozzle was at least an inch or more from the body. Why is it, then, that we have such destructive force in the application of compressed air? First: We are personally convinced that 100 to 125 pounds of air will form a solid column of air, several inches in advance of the hose or nozzle, which would almost act like a solid body, forcing open the sphincter muscles. Second: Dr. Andrews has pointed out that the anatomical arrangement of the perineum is such as to facilitate the concentration of air pressure at the anal orifice.

This anatomical condition is a peculiar formation of the pelvic floor, forming a funnel, whose apex is at the anus; the confined air expanding in this funnel will force the gut open without having the end of the pipe accurately adjusted to the anus. With the involuntary contraction of the levator and sphincter muscles, the space between the buttocks would be narrowed and the funnel deepened, thus confining the escaping air laterally, and leading it the more quickly into the bowel.

The following is an abstract from Dr. Andrews' article in regard to the amount of pressure required to rupture an intestine: With an air pressure gauge and tank of compressed air, he showed that the ordinary bursting point in a dog or ox intestine was from six to ten pounds. The human intestine showed about the same bursting point when removed from the body. Whether the strength would be greater in the living body, we do not know, but probably there would be a slight difference. Dr. Andrews also tested numerous specimens of stomach, bladder and intestines, obtained at meat shops, and from dog experiments, and found that none of the specimens were capable of bearing over 12½ pounds, the freshest specimens bursting at about 7 or 8 pounds. Senn, experimenting on the cadaver of a case of enteritis, found that the diseased bowel ruptured at 1½ pounds.

Pathology. Several cases reported by Dr. Andrews speak of minor bruises about the anus. In nearly all cases reported, the pathological condition is found intra-abdominally, and consists of hæmorrhages in the serosa, lacerations of the serosa and muscular coat, with a bulging of the mucous membrane; or there may be a complete rupture of the bowel through the serosa, muscular coat and the mucous membrane.

The sigmoid, in nearly all cases, is affected. The descending, transverse, ascending colon, together with the small intestine and mesentery, may show signs of traumatic injury, due to compressed air applied through the rectum. The extent of injury to the bowel will depend upon the patient's physical condition, whether the bowel is full or empty and the amount of air pressure applied. Air is usually found in the free peritoneal cavity. Hæmorrhage and ecchymosis of the bowel are to be expected in all cases.

The symptoms in cases of pneumatic rupture will depend largely upon the extent of internal injuries, but some of the following symptoms are characteristic: First, pain is immediate, severe and continuous; second, the face is usually sallow and somewhat cyanotic, the facial expression anxious and pinched; third, the abdomen enormously

distended, skin tense, percussion note tympanitic; very little, if any, abdominal breathing, this depending upon the amount of distention; the patient may or may not be conscious. Temperature usually normal in the early stages, but in the latter stages we may have a marked temperature, due to absorption of blood and local or general peritonitis. Respirations are increased from 15 to 40 per minute; pulse rate increases somewhat, but its volume varies in proportion to the amount of internal hæmorrhage and degree of shock; nausea and vomiting are commonly present. The legs are usually flexed upon the thighs, the thighs upon the abdomen, causing relaxation of the abdominal muscles, and thereby making the patient more comfortable. In extreme cases we may have an emphysema of the surrounding structures. Rectal hæmorrhage may or may not be present.

Diagnosis. We believe, from the reports of Dr. Andrews, and with these additional cases, it should be possible to make a diagnosis of this form of injury, even in the absence of the history, as we may some day be confronted with an individual who is unconscious, or one who is unable to speak the English language. The following points will be of diagnostic value: First, the tense, air-filled peritoneal cavity; second, the extreme pressure on the diaphragm causing a thoracic breathing and eliminating the abdominal breathing; third, emphysema of the tissues as reported in some of Dr. Andrews' cases without signs of inflammation; fourth, the common general symptoms of an abdominal injury.

Differential diagnosis would have to be from ileus, perforation, ulcer or wounds, fractures of the ribs or injury to the air passage, causing an emphysema.

Prognosis. In combining our cases with those of Dr. Andrews, we arrive at the following results:

Cases not operated upon show a recovery of 8.6 per cent.

Mortality in operative cases, 39.1 per cent.

In those cases operated upon the percentage of recovery is 21 per cent. This preponderance of deaths over recoveries in the cases operated upon must be explained by the failure in so many instances to make an early diagnosis, and more especially to resort to an early operation.

Treatment. Conservative treatment in these cases should not be considered. It may be necessary in some cases to institute a preliminary introduction of a trocar through the abdominal wall, under aseptic precautions, to permit the escape of sufficient air from the free abdominal cavity to facilitate later operative procedures. No attempt should be made to wash out the bowel prior to operation. The condition should be treated as a rupture of the intestines from blows and the earliest possible exploratory operation should be done.

The lacerations and perforations should be sutured and, if large amount of fæcal material is present in the free peritoneal cavity, a drainage tube should be inserted.

Post-operative treatment. Patient should be placed in Fowler's position. Normal saline by the drop method should be given per rectum and all further treatment should be directed toward meeting the symptoms as they arise.

A paretic condition of the bowel may be expected. The rectal tube and turpentine or glycerine enemas will be found useful in relieving the patient from the oppression of gas.

In conclusion, we want to impress upon you the following: First, that compressed air is a very universal necessity in modern industries; second, a strong warning verbally and by prominently displayed signs should be given each foreman and employee against all practical joking, or hazing, with the air hose; third, that air rushing from a compressed air hose can enter the body through the clothing and cause serious laceration of the bowel, proving fatal in many instances; fourth, that the diagnosis of this accident should be made from the physical signs alone; fifth, that the sigmoid is the most common seat of injury.

In closing this paper we desire to express our thanks to those who have enabled us to collect the histories of the above cases, and to acknowledge our indebtedness to Dr. Andrews, from whose pioneer article on this subject we have so freely drawn.

Since this article was submitted for publication the following additional case has been reported to us by Dr. Paul M. Mecray, of Camden, New Jersey:

On July 24, 1913, a robust Italian boy, aged 17, employed by a large wood-working establishment, was frolicking with some other boys during the noon hour. One of them seized a compressed-air hose which was used for clearing the bench of sawdust, and applied the nozzle to the rectum of the victim. The maximum pressure employed in this plant was eighty pounds to the square inch, but the shop superintendent estimated that at the time in question the pressure was not above ten pounds.

The investigation showed that the hose was held several inches from the anus, and that the air passed through trousers and drawers. When the boy was admitted to the hospital the following note was made by the resident, Dr. T. M. Kain:

"Patient was brought to hospital in ambulance at 1:40 P. M. The only history obtainable was to the effect that patient while sitting on a box had suddenly fallen to the floor. Upon arrival at the hospital he was found to be dead.

"Examination showed no visible marks of injury; no lacerations, bruises, no fractures. There was a small abrasion on the lip, and the tip of tongue. Abdomen was markedly distended and there seemed to be free air in the abdominal cavity. Air was also present in subcutaneous tissue all over the body, very pronounced in the pectoral regions."

At the necropsy conducted by County Physician Frank O. Stem and Dr. Mecray, the tissues about the anus were found to be ecchymosed, and the anal sphincter stretched so as to admit four fingers. There was general emphysema. On opening the abdominal cavity air escaped under great pressure. The colon was ruptured in eight places and showed the effect of stretching before rupture occurred. There was general venous engorgement, and many ecchymotic areas scattered through the small bowel.

AN ARTIFICIAL URETER MADE FROM THE ABDOMINAL WALL[1]

A Preliminary Report of an Experimental Study

By ALFRED A. STRAUSS, M. D., Chicago
From the Department of Experimental Surgery, Morris Institute for Medical Research of the Michael Reese Hospital

MANY attempts have been made by various investigators to replace a portion of the ureter which has been destroyed anatomically and functionally by inflammation, stones, benign or malignant tumors.

Prominent among the surgeons who have attempted a solution of this problem are Casati, Boari and Israel, who used tubes of silver, glass and caoutchouc. Casati, Boari and Van Hook cut a flap out of the bladder and sutured it in the shape of a tube to the proximal end of the ureter. Rydygier did the same with a flap of skin. Fenger and Bacon, Poggi and Tizzoni, D'Urso and DeFabi, Esau and Moskowicz employed loops of the intestine separated from the rest of the bowel, but still attached to their mesentery, while Giannettasio, Rydygier and Franke transplanted the appendix in the same way, and D'Urso, DeFabi, Flörcken and Stubenrauch used the uterine horns of bitches. The function of the ureters was generally impaired or destroyed because of the frequent stenosis and infection, but the transplantation of the uterine horns gave better results.

In 1908 Melchior, and afterwards Rich, Holbauer and Klepp, tried to replace in dogs a piece of ureter with various blood-vessels. Tietze and Flörcken soon found the transplanted vessel replaced by connective tissue. Chiasserini and Dominici used external jugular, femoral and saphenous veins and sometimes the carotid artery. They came to the following conclusions:

"1. There is a possibility of the vessel introduced between the ureteral ends becoming firmly united to them.

"2. A few days after the operation the piece transplanted becomes shortened so as to draw the two ureteral ends nearer together.

"3. The graft becomes thicker and harder, while the lumen is nearly obliterated.

"4. The stenosis causes a stoppage in the flow of the urine with consecutive dilatation of the canal of the ureter and hydronephrosis."

It will be noticed from the above that the various structures and organs used for transplantation have very important physiological functions. To destroy or sacrifice such an organ or structure for transplantation to another organ is not very practical.

For this reason, and in order to make a transplantation that is practical, I have tried to keep my work within the limits of the following principles:

1. The part or structure used shall be adjacent and along the line of the ureter.

2. The part or structure used for transplantation shall have no important physiological function, nor be part of an important or vital organ.

3. The transplant used shall retain two of its most important physiological requirements in order that it may remain in its highest state of resistance, namely, a definite nerve and blood supply.

With the above facts in mind, the following surgical procedure was carried out: An incision was carried from one-half inch below the angle of the twelfth rib in the midaxillary line downward to within one inch medianward of the anterior superior spine of the ilium. The muscles were divided down to the transversalis. The internal oblique was divided and dissected back as far as its iliolumbar fascial attachment laterally and medianward to the belly of the rectus muscle. This exposes the transversalis muscle, as shown in Fig. 1, with its blood and nerve supply, the anterior branches of the lumbar arteries and nerves.

A flap was now made, as is shown by the dotted line in Fig. 1, which includes the transversalis muscle, fascia and peritoneum. The peritoneum, fascia and muscle were closed

[1] Accepted for publication October 31, 1913. Read before the Chicago Surgical Society, November 7, 1913. (See discussion p. 122.)

with one suture starting at the superior angle of the pedicle of the flap, and while suturing the pedicle the sutures only penetrated the peritoneum and transversalis fascia, as shown in Fig. 2.

The operation is now absolutely extraperitoneal. The ureter was exposed in the region of the flap and the two small ureteral arteries, which are on each side of the wall of the ureter, were tied with fine arterial silk at both the distal and the proximal ends. Two or three inches of the ureter were next resected. A temporary ligature was placed on the proximal end of the ureter. The lower free edge of the flap was picked up and the peritoneum and transversalis fascia separated from the transversalis muscle for about 0.5 cm. An end-to-end anastomosis with the distal end of the ureter was made in such a way that the fascia and peritoneum were slightly within the ureter and the muscle without, as shown in Fig. 3.

The proximal end of the ureter was placed on the upper portion of the flap and an end-to-end anastomosis made by a continuous circular suture. Here, however, the peritoneum is not within the lumen of the ureter (Fig. 4). The edges of the flap were closed to complete the tube, using a continuous over-and-over suture going upward and crossing this with a suture downward, so as to make a figure X (Fig. 5). Fine arterial silk was used for the anastomosis and flap closure. The temporary ligature was removed and the artificial ureter as well as the ureter below the anastomosis became distended with urine and the rhythmic ureteral wave passed on over the ureter. A fine rubber drain was left in the wound for the first few days to allow for the slight leakage of urine that might occur.

At the end of seven months one of the dogs was anæsthetized and opened. The pedicle of the flap was normally intact. The artificial ureter was shortened to about one-third its original length so as to draw the ureteral ends nearer together. The circumference and lumen of tube were of the same size as when first constructed. The tube as a whole felt hard and non-compressible. The peritoneum was adherent to it on one side and to the internal oblique on the other. Many well-defined blood-vessels could be seen adjacent and in the adherent tissues. The ureter was now divided three inches below the distal anastomosis and urine came through in jets in about normal quantity.

The specimen was removed and an opening made in the ureter about one inch above the proximal anastomosis. A probe could be passed with ease through the artificial ureter and its anastomoses and also a second smaller probe could be passed alongside of it. The hardened artificial ureter was opened with scissors. It cut with difficulty. Its inner surface appeared smooth and had the appearance of a lining membrane. The body of the tube felt hard. This we assumed to be due to infiltration of calcium and urinary salts. The anastomoses showed no evidence of contraction or stenosis. The kidney showed no changes.

Six and one-half months after operation dog No. 2 was anæsthetized (Fig. 6). The artificial ureter showed the same hardness and shortening as in No. 1. This time the bladder was opened and the papillæ examined. The urine came through the ureter, but not as freely as No. 1. The papillæ appeared normal. On opening the artificial ureter, a fair sized calculus was found lodged in the distal anastomosis. This calculus had the end of a fine silk thread as its nucleus and undoubtedly produced the partial obstruction and a corresponding dilatation of the ureter and hydronephrosis. The anastomoses, however, showed no contraction and the lumen of the artificial ureter was of the same size as originally made.

Dog No. 3 was anæsthetized six months after operation and showed the same as No. 2. Here the artificial ureter was so large as to form a pouch, which caused a slight dilatation of the ureter and a hydronephrosis, but no stenosis of anastomoses. In this experiment the artificial ureter was made exceptionally large, which accounts for the pouching.

Dog No. 4, which was very small, was examined five and one-half months after operation. A contraction was found and an almost complete obstruction of the lower anastomosis and a marked dilatation of ureter and hydronephrosis.

Histology. A section of the artificial ureter was taken from each of the above specimens. The portion taken was midway between the proximal and distal anastomoses and showed: (1) in place of the peritoneum a typical transitional epithelium together with its basement membrane, outside of which is a thin layer of areolar tissue. (2) In place of the transversalis fascia a layer of bone was seen well organized with typical osteoblasts, blood-vessels and lymph-vessels. (3) The transversalis muscle showed no changes. The epithelium is probably a proliferation of the epithelium from the ureter, since it is of the transitional type and has the same appearance as that in the ureter proper. The basement membrane of the peritoneum acts as a matrix for its implantation. The transformation of the transversalis fascia into cartilage in the earlier stages and into bone in the later stages is explained on the following embryological and chemical basis.

Embryology. The abdominal wall is formed originally from the mesoblastic somites, the median portions of which lie in immediate contact with the notocord and are known as the sclerotomes. They grow inward toward the median line surrounding the spinal cord and forming the vertebræ, while the lateral portions of the mesoblastic somites form the musculature and are known as the myotomes. These lateral portions grow ventrally until they meet in the midline their fellows of the opposite side. Thus we see the vertebræ and abdominal musculature formed from one embryological layer and structure—the mesoblastic somites.

Chemistry. The flap in its original position is in contact with a neutral media, the peritoneal fluid and alkaline reaction of the blood and lymph. When transplanted it comes into contact with the urine, which is acid, due to the acid sodium phosphate content. The tissues probably become infiltrated with this acid medium, which produces a sclerosis, and according to H. Gideon Wells, calcification and ossification commonly occur in tissues which have an excess of acid present. The cartilage stage, which is seen in the dog five and one-half months after operation, also speaks in favor of this hypothesis. Cartilage, which is the favorite site of calcium deposits, takes on a basic stain implying that it is of an acid reaction, and this in turn is probably due to the presence of chondroitin sulphuric acid. The flap, which originally had a definite blood supply, is reinforced by new blood-vessels, as may be observed in the histological sections. We know the plasma from the blood and body fluids furnishes calcium which infiltrates the cartilage to form bone, which is seen in the later stage in sections (Fig. 11). Thus we note on the one hand the acid infiltrated tissues showing slight degenerative changes due to the irritating action of the urine, forming an acellular matrix of cartilage; on the other, the body fluids which infiltrate the cartilaginous matrix with calcium, converting it into bone. These two facts, together with the osteogenetic potentiality inherent in this particular group of muscles and fascia, account for the transformation of the transversalis fascia into a bony plate.

The histological sections show that practically few or no degenerative changes have taken place where the bone is formed. This is in marked contrast to the process involved in pathological bone formation, in which a granular detritus becomes infiltrated with calcium, then undergoes vascularization and is changed into bone. Our own sections, however, show a bone formation closely resembling that of normal bone, with a cartilage stage, then a calcium infiltration and finally a bone formation. It will also be noted in these sections that the bone contains many large blood-vessels and lymph spaces; the transversalis muscle which surrounds the bony plate is also well preserved and highly vascularized, all of which speaks largely against a degenerative process of any extent having taken place.

To strengthen the above hypothesis of bone formation, and to show that it is not unusual for bone to be found in the body irrespective of its proximity to bone tissue, I will cite a report of autopsies by Poscharissky. In 29 cases of calcified areas in the eyeball following suppuration, bone was found in 25 of them. Calcified nodules from the lungs of 28 persons were examined and in 17 of them bone was found. In 3 of 14 calcified nodules of heart

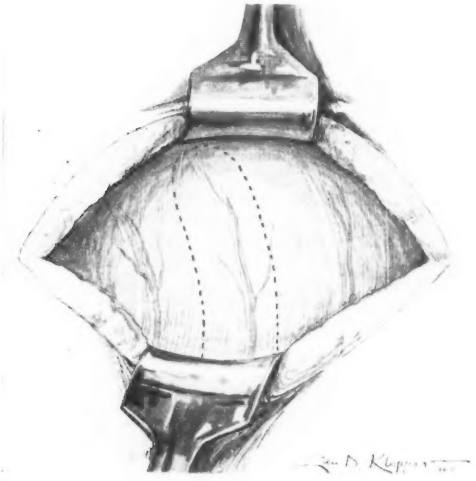

Fig. 1. Operative procedure.

Fig. 2. Operative procedure.

valves, bone was present. Calcified nodules in the liver and in the mesenteric glands are also often ossified, and, in fact, there is hardly a tissue in the animal body in which the transformation of calcified into ossified tissue has not been observed.

The explanation of this pathological bone formation is given by H. Gideon Wells in his classic monograph on ossification and calcification as follows: "The process by which these inert, dead calcified areas are converted into living bone tissue is entirely analogous to the normal formation of bone in endochondral ossification. The calcified material simply takes the place of the primordial cartilage, vascular granulation tissue eroding it and the cells of the granulation tissue undergoing a differentiation into osteoblasts which constitute an osteogenetic layer and form the new bone. When there is no preliminary calcification of a necrotic tissue we get no subsequent ossification, and it seems that the calcium salts exert a specific influence on the connective-tissue cells which causes them to take on active growth and to undergo a metaplasia not only into osteoblasts and bone corpuscles, but apparently even into marrow."

Liek was able to obtain bone formation constantly in the pelvis of the rabbit's kidney within sixteen to twenty days after ligating the renal artery provided he wrapped the kidney with omentum to secure a free collateral circulation. Without this collateral circulation it requires about three months for ossi-

Fig. 3. Operative procedure.

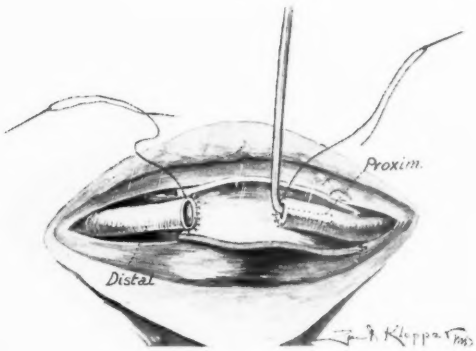

Fig. 4. Operative procedure.

fication to appear. These and other experiments by the same author show that the amount of blood supply is an important factor in determining pathological ossification. With too free a circulation, there is no calcification and no ossification. With too little circulation, necrosis is followed by slow calcification and either late or no ossification. Liek's experiments on rabbits, which have a neutral or alkaline urine, throw some doubt on the acid urine infiltration theory. So it is possible that some other chemical factor produces this irritation or that the tissues are in contact with an unaccustomed chemical medium.

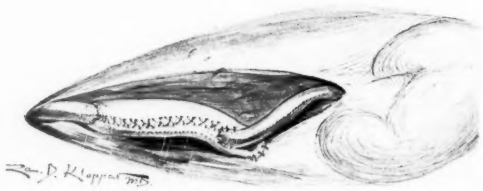

Fig. 5. Operative procedure.

The same surgical procedure was tried on the common bile duct but with indifferent results. This was undoubtedly due to the difficulty with which the anastomosis was made. We have also some living dogs, operated three months ago, in which a free transplant was used instead of a pedicle transplant. The results of the latter will appear in the near future.

CONCLUSIONS

1. The flap from the abdominal wall forms a patent non-collapsible bony tube lined by

Fig. 6. Six and one-half months after operation.

Fig. 7. Five and one-half months after operation.

Fig. 8. Six months after operation.

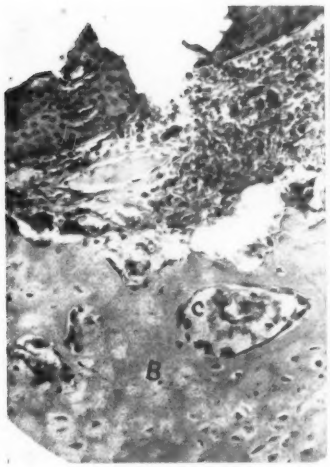

Fig. 9.

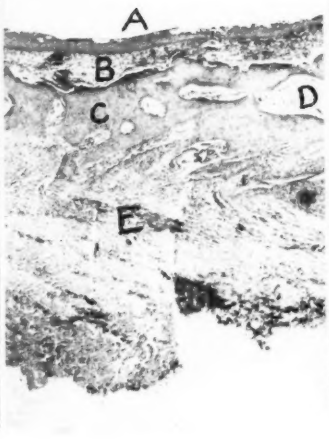

Fig. 10.

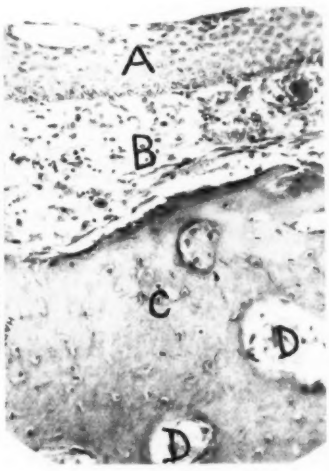

Fig. 11.

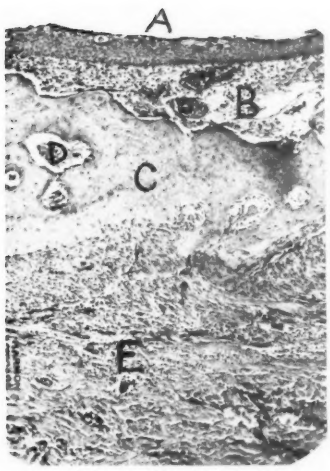

Fig. 12.

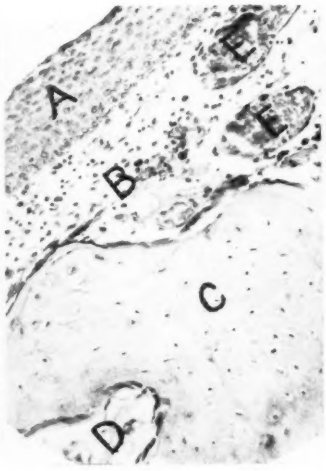

Fig. 13.

Fig. 14.

Fig. 9. Section showing cartilage. A, transitional epithelium; B, cartilage; C, blood-vessel.

Fig. 10. A, epithelium; B, areolar connective tissue; C, bone; D, blood-vessels and lymph spaces in bony plate; E, transversalis muscle.

Fig. 11. Fig. 10 under high power. A, transitional epithelium; B, areolar connective tissue; C, bone; D, blood-vessels.

Fig. 12. A, epithelium; B, areolar connective tissue; C, bone; D, blood-vessels in bony plate; E, transversalis muscle.

Fig. 13. Fig. 11 under high power. A, epithelium; B, areolar connective tissue; C, bone; D, large blood-vessel; E, blood-vessels in areolar connective tissue.

Fig. 14. A, epithelium; B, bone; C, cartilage remaining in bony plate; D, blood-vessels; E, transversalis muscle.

transitional epithelium and covered by the transversalis muscle.

2. Anastomosis remains patent on account of the non-collapsibility of the bony tube and the hydrostatic pressure within the ureter.

3. Hydronephrosis occurred in several cases: in one due to a calculus; in another due to the pouching of too large an artificially made ureter, and probably the interruption of the ureteral peristaltic wave.

I wish to thank Dr. J. W. Jobling and Dr. E. Kirk for the valuable advice and suggestions they have given me while carrying on this work.

THE RELATION OF MULTIPLE ADENOMATA TO THE ETIOLOGY OF THE ENLARGEMENT OF THE PROSTATE GLAND

By JAMES A. GARDNER, M. D., and BURTON T. SIMPSON, M. D., Buffalo, New York

IN 1911 one of us, in studying the growth centers of the benign adenomata of the thyroid and prostate glands, was struck by the frequency with which these tumors were the apparent cause of the enlargement of the prostate gland, and also by the fact that one could find isolated small adenomatous nodules in normal sized prostates before the so-called hypertrophic age, namely, between forty and sixty years of age.

In reviewing the literature of prostatic hypertrophy it was surprising to find that English and American authors were not inclined to accept true adenoma formation as an important factor in the etiology of this condition. In the first paper only seven enlarged prostates were studied, but from the fact that the entire seven showed adenomatous enlargement, it occurred to us that a study of a greater number of glands would give valuable information concerning this factor in the etiology of this condition.

In reviewing the literature one finds a great diversity of opinion regarding the genesis and pathological anatomy of the condition commonly called prostatic hypertrophy.

Virchow (1) taught that the so-called hypertrophy should be separated into two classes, one belonging to the myomata and the other to the gland tumors, from which we must conclude that he considered the enlargement of the prostate as a true tumor formation.

Billroth (2) wrote that, in so far as his investigations went, prostatic hypertrophy was never connected with adenoma formation, but was a dilatation of the acini with perhaps some hyperplasia. He believed that nodular or diffuse myoma formation was common.

According to Socin (3) prostatic hypertrophy is a name given to a variety of pathological conditions having in common the enlargement of this gland. In his opinion the ordinary enlargement is neither of inflammatory origin nor a true hypertrophy, but a true tumor formation.

Cohnheim (4) stands out definitely for the tumor theory, as may be concluded from the following: "The new growth which one commonly calls hypertrophy of the prostate is neither inflammatory tissue nor, notwithstanding its name, legitimate hypertrophy, but true and undoubted tumor formation."

Lannois (5), a pupil of Duyon, did not consider senile prostatic hypertrophy as true tumor formation, but as a part of an extensive arteriosclerotic process which begins in the kidneys and extends throughout the entire genito-urinary system.

Rindfleisch (6) assigned the cause of prostatic enlargement to tumor formation. He described two forms, the more rare fibrous, accompanied with atrophy of the glands, and the much more common form, namely, the discrete nodular adenomatous.

Birch-Hirschfeld (7) considered the enlargement of this gland as an expression of new growth, and assigns its origin to the budding of the gland tubules.

Lydston (8) believed that prostatic hyper-

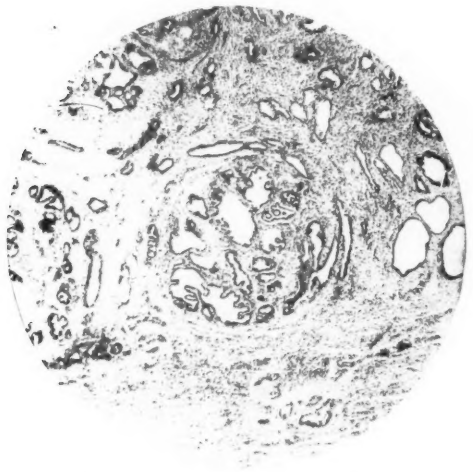

Fig. 1. Early isolated adenoma, with a slight indication of capsule, with connective tissue and gland substance becoming compressed.

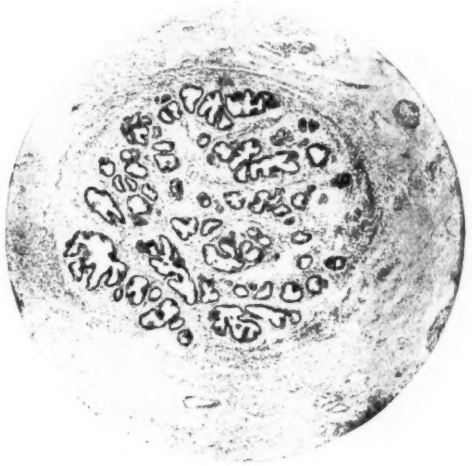

Fig. 2. Same as Fig. 1, but a later stage.

trophy began in the period of sexual activity and was the result in the majority of cases of sexual excesses.

Jores (9) called attention to the fact that apparently hypertrophy of the so-called middle lobe took its origin in the suburethral accessory glands.

Aschoff (10) demonstrated these suburethral accessory glands not only in the males but also in females in the new-born.

Ciechanowski (11) wrote a voluminous article supporting the inflammatory theory of prostatic enlargement, particularly emphasizing the part played by gonorrhœa. He believed that a long-continued chronic inflammation was the basis of the changes which take place in prostatic hypertrophy. He admits that true adenomata and myomata may occur rarely, but they have nothing in common with prostatic hypertrophy.

Beginning with Albarran (12), the majority of French investigators, Motz and Perearnau (13), Marion (14), Marquis (15), and Chevassu (16), hold that prostatic enlargement is due to true tumor formation, their only difference of opinion being in regard to whether they take their origin solely from periurethral accessory glands or whether they may spring from any part of the gland itself.

Stoker (17) does not believe in the so-called middle lobe, but holds that the enlargements which occur at the proximal urethral orifice are caused by either myomata or adenomata. The enlargement of the gland proper he considers as a true hypertrophy, which may be associated with encapsulated adenomata.

Rotschild (18) advocated the inflammatory theory and believed the enlargement was due to dilatation of the acini caused by obliteration of the excretory ducts. Bangs also upholds this view, although he believes that gonorrhœa plays little or no part in the process, but would emphasize the factor of long-continued congestion which occurs in long-continued and often repeated sexual excitement.

Wichmann (19), in an investigation of the etiology of prostatic enlargement, concluded that inflammation plays little or no part in the production of this condition.

Wallace (20), Tietze and Lendorf (21) accept prostatic enlargement as adenoma formation, the latter holding that the tumors always spring from the periurethral accessory glands.

Alexis Thomson (22), in a series of ninety enlarged prostates, wrote that he had never met with an encapsulated adenoma or fibroadenoma, and doubts if such exists. He believes the enlargement to be due to diffuse

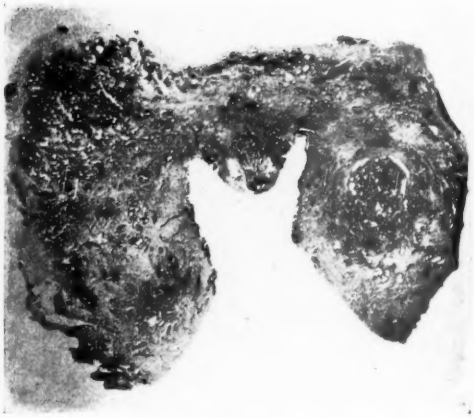

Fig. 3. Cross section of prostate in region of colliculus showing isolated nodule in lateral lobe.

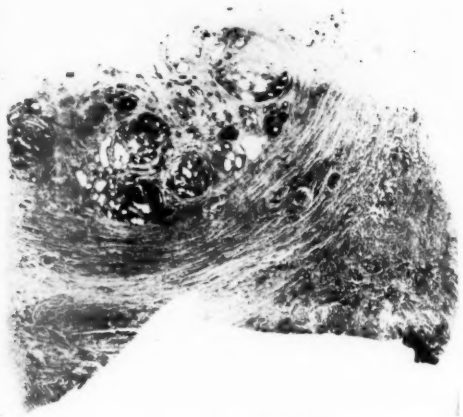

Fig. 4. Showing multiple adenomata in prostate.

hyperplasia of both the gland and musculofibrous tissue.

Von Frisch (23) declares that we can only conjecture concerning the cause of these idiopathic tumor formations, the definite cause being unknown.

Adami and Nichols (24) teach that while prostatic hypertrophy may precede the development of definite neoplastic conditions within the organ, it must nevertheless be sharply distinguished from the same. "With the more recent authorities we should regard it as the outcome of a long-continued, chronic inflammation, more particularly involving the urethral portion of the gland."

Simmonds, in Aschoff's Pathological Anatomy, writes that the more recent thought concerning prostatic hypertrophy gives a very subordinate place to the inflammatory, and considers the enlargement of this organ to be due to true tumor formation.

G. Cuttat (25) in 1912, in summing up his studies on the etiology of prostatic hypertrophy, writes as follows:

"(1) Etiologically speaking it is not possible for us to admit that an infection leading to chronic inflammation can explain prostatic hypertrophy.

"(2) That hypertrophy of the prostate does not enter into the category of true tumors.

"(3) The prostatic hypertrophy is a true fibro-epithelial degenerance which finds its analogy anatomo-pathologically in fibro-epithelial tumors of the thyroid and breast, the glandular and connective-tissue elements taking nearly equal parts in augmenting the volume of the gland, the cellular infiltration being of secondary origin."

In summing up this review of the literature one must admit that there is a diversity of opinion concerning this pathological process. It would appear that the more recent investigators are in accord with the view that the condition is a new growth. The discussion at present seems to be concerning the origin of these tumors. For instance, Motz, Marion, Marquis, and Lendorf believe that these adenomata always arise from the periurethral accessory glands, while Chevassu writes a paper the sole object of which is to refute this theory, which he says is against the teachings of his master, Albarran. On the other hand, Tandler and Zuckerkandl (26) believe that prostatic hypertrophy always takes its origin from the middle lobe, which they describe as that part of the prostate which lies between the urethra and the ejaculatory ducts.

The material for our study consists of one hundred prostate glands, eighty of which were obtained at autopsy and twenty from operation.

The ages of our cases are shown in the following table:

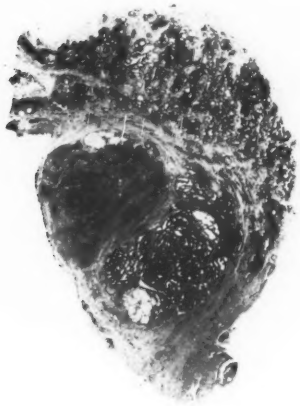

Fig. 5. Section of half a prostate showing large adenomata lying outside of fibromyoma.

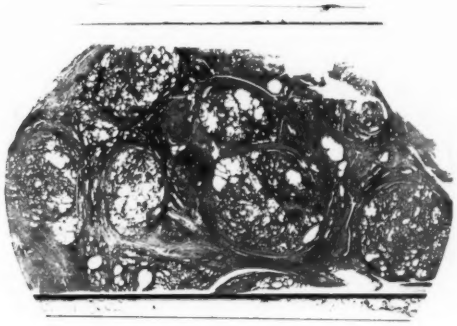

Fig. 6. Section of prostate showing multiple adenomata well isolated and marked off by distinct capsule.

TABLE NO. I

	AUTOPSY									
Age	1–10	10–20	20–30	30–30	40–50	50–60	60–70	70–80	80	Total
No.	2	3	3	7	19	21	18	6	1	80
	OPERATION									
No.	...	...	...	...	...	1	12	15	2	20

That prostatic enlargement may occur as the result of the dilatation of the acini or from other of the causes assigned to it is not denied here; but that eighteen of the twenty enlarged prostates which occurred in our series were the result of true adenomata formation there can be no doubt, and we believe the majority of enlarged prostates are due to this cause. There are many circumstances which lead one to this conclusion. In the first place it is against pathological principles to expect true hypertrophy at the time of life when enlargement of this gland occurs. As a matter of fact the prostates in our series that did not show adenomatous enlargement at this age showed atrophy. On the other hand, we find benign neoplasms at this age, as is illustrated by the adenomata of the thyroid and myomata of the uterus.

Many other theoretical considerations could be advanced. But what is more essential is the demonstration of the development of these adenomata from tiny isolated nodules to an enlarged gland filled with such tumors.

If we study a series of prostates of men between the ages of forty and sixty we are enabled to demonstrate such a development as has been heretofore spoken of.

Of the exact origin of these nodules we know as yet very little. Various investigators have explained their origin in various ways. For instance, Motz, Marion, Cuneo and others believe that these adenomata always have their origin in the periurethral accessory glands. Birch-Hirschfeld describes them as being the result of budding of the gland tubules. Tietze believes that these tumors spring from isolated nodules which are separated from each other by loose connective tissue. Chevassu does not agree with some of his confreres in regard to the periurethral glands as being the sole place of origin of these tumors, but believes that they may arise from any portion of the gland. We are in accord with Chevassu in this regard, for we have found adenomatous nodules in the so-called surgical capsule, which also disproves Tandler and Zuckerkandl's theory that prostatic hypertrophy always begins in the middle lobe. Besides this we have found normal gland tissue between the adenomata. Personally we are inclined to believe that these tumors originate from isolated glandular tissue, and that this may occur in any part of the prostate gland.

We think that by studying the following

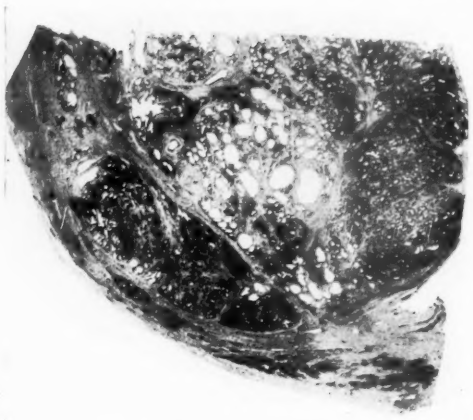

Fig. 7. Lower left quadrant of enlarged prostate showing multiple adenomata.

table one may draw interesting conclusions.

TABLE NO. 2

	1–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	Totals
AUTOPSY										
Normal	2	3	3	6	14	14	13	2		57
Adenoma	...	...	1	5	7	5	4	1		23
OPERATION										
Myoma or interstitial proliferation					...	2	...	...		2
Adenoma	...	...	...	...	1	10	5	2		18
AUTOPSY PAST 40 YEARS										
Normal				...	14	14	13	2	...	43
Adenomata	...	...	...		5	7	5	4	1	22

In studying the fifteen prostates between the ages of one and forty, only one (thirty-eight years) was found in which adenomatous nodules were present. Between forty and sixty, twelve were found which contained these nodules, or forty-three per cent. While in the twenty-four prostates between sixty and eighty, but two (61 and 63 years) were found that contained only isolated nodules, the others being adenomatous enlargement. We may assume from these facts that between the ages of forty and sixty is the common period of the first appearance of these nodules, or the beginning of prostatic enlargement. In the period between sixty and eighty, these nodules reach their maximum and produce the clinical symptoms which we recognize as prostatic hypertrophy. If we consult Table No. 3, we will notice that the prostates in this series

TABLE NO. 3

Age	40–60	60–80
Isolated Adenoma	12	2
Adenomatous enlargement	1	7
Normal[1]	29	10
Atrophy	0	6

[1] Normal as regards adenoma formation.

of individuals between sixty and eighty show one of three conditions, viz., adenomatous enlargement, an atrophy, or were normal.

In studying adenomata of the prostate gland it is necessary that one use the lowest power lenses on the microscope or a simple lens. The most convenient is the dissecting microscope. By this method it is very easy to pick out these little nodules from a slide containing a cross section of the prostate. In the younger nodules one is attracted by a round or oval, deeply-stained nodule around which can be seen a thickening of the adjacent tissue (Fig. 1). Fig. 2 shows a little later stage in the development of these adenomata. The epithelium has proliferated and resembles the normal epithelium of the prostate when seen with the higher powers of the microscope.

The interstitial tissue varies from the normal in that there is a marked preponderance of the connective-tissue element. One notes already the compression of the surrounding normal prostatic tissue with its low epithelium, which is in marked contrast to the high columnar of the adenomata. Fig. 3 depicts a still later stage in the development. In this section we note that the epithelial element predominates, also at the sides we can see the compressed normal prostatic tissue.

In conclusion we would say that so far as our research with enlarged prostates reaches, the condition in the majority of cases is caused by the growth of multiple adenomata.

NOTE. The so-called surgical capsule made of compressed prostatic gland and containing a distinct small adenoma. This demonstrates the fallacy of Tandler and Zuckerkandl's theory that the prostatic enlargement always springs from middle lobe.

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DEPARTMENT OF TECHNIQUE

THE TREATMENT OF RECURRENCES AND METASTASES FROM CARCINOMA OF THE BREAST[1]

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THE group of patients indicated by the above title are usually regarded as hopeless, and at present we must admit that no method of treatment is entirely satisfactory. Some remarkable results have been accomplished by the methods that I shall describe, but these results are far from ideal, and in the end failure is the rule, and complete success is the exception. Even with this dismal introduction, I am not without hope. More has been accomplished by radiotherapeutic measures than by any other method of treatment of this group of cases. The partial success obtained may point the way to complete eradication of the disease, and permanent cure.

GENERAL REMARKS ON THE METHOD OF TREATMENT

In general, the treatment has consisted in the application of the röntgen rays as promptly and as vigorously as possible after the patient has been first brought to my attention. The rays have been applied from as many directions as possible, and carried to the limit of skin toleration, after filtration. To this has been added every measure that would tend to improve the patient's general health, so far as circumstances would permit. Combined with the above results I have added small doses of thyroid extract.

The use of thyroid extract. It is well known that the rays, applied to the thyroid gland, tend to diminish its secretion, and in time lead to atrophy of the gland. In the application of the rays for recurrences and metastases from carcinoma of the breast, much of the radiation reaches the thyroid gland, and therefore, theoretically, would tend to diminish the secretion. This fact, together with the fact that at the time of life when carcinoma is most common the thyroid secretions naturally tend to diminish, leads me to believe that the administration of thyroid extract is distinctly indicated. During the past two years I have used thyroid extract in one hundred and fifty cases, and I am led to believe that it has improved my results to a considerable extent. I believe that with increased knowledge, the administration of the extract can be regulated so far as to accomplish even more.

I usually begin with the administration of one-half a grain of thyroid extract, three times a day, after meals. This is increased every four days one-half a grain in the daily dose, until the patient is taking one and a half grains three times a day. I have not at any time given over two grains, three times a day.

In only a few patients have I obtained any symptoms that I think can be referred to the administration of the thyroid extract. These symptoms consisted of an increased pulse rate, a sensation of faintness and weakness, and at times a slight headache. These symptoms disappeared after the interruption of the thyroid extract for a week.

CASE 1. Mrs. C., age 61, was referred to me by Dr. Ernest Laplace on October 29, 1903. She had been operated upon by Dr. Laplace for carcinoma of the left breast three years previously. During a year recurrences with pain had been developed in the operative wound, and in the axilla. Firmly adherent nodules were found, varying from one-half to one inch in diameter, and extending into the axilla. Small, hard, adherent glands were also found in the supraclavicular region. Active treatment was given for three months, at the end of which time a mild dermatitis developed, but the nodules had disappeared, and the patient was free from symptoms. Against my advice she took a trip across the continent, returning at the end of three months with an increased development of the disease, and presenting at this time large, adherent masses in the supraclavicular region, resulting in paralysis of the left arm. Under treatment during three months, all evidence of the disease again disappeared. The patient even recovered the use of her left arm. She again interrupted treatment for a three months' vacation, at the end of which time she returned suffering from excruciating pain in the left axilla and arm, with palsy and atrophy of the muscles; also enlargement of the supraclavicular glands. X-ray examination showed enlarged mediastinal

[1] Read before the Seventeenth International Medical Congress, London, August 6 to 12, 1913.

glands. She was placed under active treatment, which was continued for nine months, at the end of which time she seemed to be well excepting for the atrophy and palsy of the left arm, from which she never recovered. After this she was seen at intervals during the following five years, at the end of which time she died from intestinal disturbances, which may or may not have been a part of the primary disease. No autopsy was permitted, but the patient's symptoms were chiefly diarrhœa and exhaustion.

In this case we had to do with the extensive recurrences and metastases which extended even into the mediastinum; yet through the action of the rays this patient was kept alive, and fairly comfortable, during a period of seven years, during which time she made several trips across the continent, traveled extensively through Europe, and was able to carry on her usual duties. The palpable evidence of the disease had disappeared. The palsy and atrophy of the muscles, following the neuritis, caused by the pressure of the glands, did not disappear, excepting after the first attack.

Case 2. Mrs. S., age 45, was referred to me by Dr. Chas. Johnson of Charleston, South Carolina, October 9, 1902. She had had her left breast amputated two years previously. During six months she had been suffering from a recurrence in the scar, one and a half inches in diameter, firmly adherent, tender and painful. Active treatment was continued during two years, during which a mild dermatitis had been produced several times, but which resulted in a complete disappearance of all evidence of the disease. Treatment was then interrupted, and two years later the patient returned with a secondary degeneration of the skin, resulting from the radio-dermatitis. This area then covered about one inch in diameter. It was excised and examined microscopically, but not found malignant. She is still living, and apparently well to-day, eleven years after beginning the treatment for the recurrence.

In this case the treatment of the röntgen rays, given even during the early days when technique was poorly developed, resulted in an apparent cure, which has lasted during a period of approximately eleven years. The secondary degeneration, resulting from a dermatitis, could probably be avoided by present day technique.

Case 3. Mrs. C., age 42, was referred for treatment by Dr. Wm. L. Rodman, July 22, 1903. She had been operated upon for carcinoma of the breast six months previously, and was then suffering from recurrence in the wound, an adherent nodular mass in the axilla, with severe pains radiating down the arm. She was treated actively twice a week, for ten months, at the end of which time she seemed to be well, and was still well April 1, 1909, when last heard from. She received in all fifty-five treatments. All evidence of the disease disappeared, and the patient seemed quite well.

Case 4. Mrs. J. F., age 46, was referred for treatment on May 11, 1911, by Dr. R. D. Newton. She had had a complete operation for advanced carcinoma of the left breast in September, 1910. She had noticed nodules forming in the operative field, beginning about three months before coming to me. At her first visit I found an extensive, nodular infiltration of the entire operative field; hard, adherent glands in the supraclavicular region; swelling of the left arm; a general infiltration of the subcutaneous tissue below the axilla, and some infiltration of the opposite breast. It was looked upon by myself and everyone as a hopeless case, but a most remarkable result followed. At the end of 48 hours, following two full dose treatments, the diseased tissue had been reduced to one-half. This reduction affected even areas that had not been directly exposed to the rays. Under active daily treatment, the disease progressively disappeared, until no evidence of the disease could be detected. She was shown before the surgeons at the Clinical Congress in November, 1911, at which time, to all outward appearances, she seemed to be well.

Apparently the rough handling that she got over the tissues at this time seemed to excite the disease, for following this demonstration the disease began to grow, spread rapidly, and was very little influenced by treatment. This case is very instructive. The fact that extensive subcutaneous infiltration of metastatic carcinoma should show a reduction to one-half at the end of 48 hours from the time treatment was begun would suggest that in some way in this case antibodies were produced which assisted in the removal of the disease, for diseased tissue was affected even in areas that were not directly treated.

The fact that the disease continued to disappear until none of it could be palpated and the patient seemed to be physically well, would seem to indicate that this change was brought about through the action of the rays, and careful observation of such results may point the way to a more ideal treatment of the disease. It teaches us that even hopeless cases will sometimes respond to treatment. It teaches also that rough palpation should be avoided in the areas previously involved.

Case 5. A similar case, and the most extensive carcinoma that I have ever seen, was that in a woman, age 48, who was referred to me by Dr. Radcliffe Cheston, December 28, 1911. She had been operated upon for carcinoma of the left breast in September, 1910. When I first saw her, she was bedfast, and had an open ulcer the size of her hand over the operative field, with general infiltration of the subcutaneous tissue, extending into the left axilla, up to the clavicles, across the sternum, and involving the opposite breast, which was one large mass of carcinoma, extending up to the clavicle on the right side, and into the axilla of the right side. Nodules extended down below the costal border on both sides. The patient suffered from severe pain and weakness.

Under active treatment during five months, the ulcer healed, all the infiltration of the subcutaneous tissue disappeared, and the right breast was reduced to about one-third of its original size. This, however, was still firm and fibrous, though not adherent. At this time she was able to walk, though not strong, and was planning to go away for the summer. Apparently through some indiscretion in diet, she developed a diarrhœa, resulting in a gaseous accumulation in the intestines; embarrassed respiration, which was followed by hypostatic pneumonia, from which she died on July 31, 1912; or, approximately seven months after beginning treatment, and two months after the outward evidence of the disease had disappeared.

The disappearance of so extensive a disease under the influence of the rays certainly proved a most decided effect of the treatment. Whether

the visceral symptoms were secondary to the original disease, or whether it was an intercurrent infection, no one will ever be able to say positively. No autopsy was permitted. X-ray examination shortly before her death showed consolidation of the bases of the lungs, with new involvement of the upper portion, and new involvement of the mediastinum. This fact would seem to indicate that her death was not due to visceral metastases. It would seem to indicate that if the disease had been treated a year earlier, or immediately after the operation, we would surely have had a right to expect recovery.

CASE 6. This case is almost identical with the previous case, and serves as an illustration of another very extensive carcinoma *en cuirasse*. This patient, Mrs. B., age 40, was referred by Dr. Isaac Leopold, June 13, 1911. Five years previously she had her left breast amputated by Dr. Edward Martin, and two years previously he removed a growth from beneath the right breast. During six months an extensive recurrence had developed, and when she was brought for treatment, the entire left side of the chest, extending back to the posterior axillary line, and extending across the sternum, involving the entire right breast, and extending into the right axilla, was one carcinomatous infiltration, with outlying nodules, and with small shining nodules in the surface of the skin. Daily X-ray treatments were given, and the disease was attacked from all sides. In six months the disease had disappeared from the anterior surface of the chest, but there was an extension through the lymphatics of the subcutaneous tissues on the left side, extending to the spinal column, covering an area about five inches broad. Treatment was begun on this on December 12, 1911, and in six weeks the disease had disappeared from the back. She was then kept under treatment at intervals until March 19, 1913, when treatment was interrupted for a time, and she developed a pleuritic effusion on the left side. This filled the chest, and was later withdrawn, and the pleural cavity infiltrated with oxygen. A röntgen examination was then made, and no evidence of mediastinal or pulmonary metastasis could be found. This fluid has recurred several times in the chest, and we are uncertain as to whether this is due to a malignant infiltration, or not.

One would think that the röntgen examination would have shown some evidence of the disease, if this could have been the cause. We are at least certain that a very extensive carcinomatous infiltration of the subcutaneous tissues, involving the greater portion of the chest, completely disappeared, making the patient comfortable, and enabling her to live at least two years longer than she would have otherwise. The outcome at present cannot be predicted.

CASE 7. Mrs. B., age 56, referred by Dr. John B. Deaver, December 1, 1910, had an operation for removal of the breast three months previously. At the time of beginning treatment there was distinct evidence of recurrence in the axilla and supraclavicular region. Under active treatment by the rays, there was some reduction in the disease, but on April 11th, Dr. Deaver still found deep axillary and infraclavicular disease. This was associated with swelling of the arm, and pain. Treatment was continued until September 1, 1911, when all evidence of the disease had disappeared. She then developed an exfoliated dermatitis, involving both the skin and mucous membrane over the entire body. Since then she has remained perfectly well, the time now being two years and nine months since beginning treatment for deep recurrence. Her attending physician believed that she also had mediastinal involvement at the beginning of treatment. To-day she seems to be perfectly well.

CASE 8. Miss H., aged 45 years, referred to me by Dr. William Martin, October 5, 1911. She had noticed a tumor in her right breast several months, which she thought followed a bruise (walking into a rail). A sister had died from a carcinoma of the uterus about a year previously. Examination showed a tumor in the right breast about half the size of a hen's egg, a small palpable gland in the axilla, and a barely palpable gland in the right supraclavicular region. In the upper and outer quadrant of the left breast a tumor about the size of a pigeon's egg was palpable. She had signs of osteo-arthritis in the cervical and upper dorsal spine. She had a polypus on the cervix of the uterus.

There was some doubt in the diagnosis, therefore I referred her to Dr. M. P. Warmuth, who amputated the right breast, cleared the axilla, and removed the small gland from the right supraclavicular region and a polypus from the uterus. Microscopical examination by Dr. Henry S. Wieder showed distinct scirrhous carcinoma.

Within two weeks after the operation, she had the excruciating pains of carcinoma, and within a month the entire operative area was indurated and showed distinct recurrence in the wound, the axilla, and the supraclavicular region, recognized by Dr. Warmuth and myself. At the same time the tumor in the left breast increased in size to that of a fist; and with enlarged glands in the axilla.

Very active daily treatment was given to the recurrence on the right side until a slight dermatitis appeared, then treatment was given to the left breast — which was clearly inoperable, under these conditions — and each side was treated in turn until all evidence of the recurrence had disappeared from the right side, and until the left inoperative breast had become soft and all parts freely movable. On the two sides she had had in all one hundred and eighty-six applications of the rays. At the end of nine months no distinct evidence of the disease could be recognized. She had returned to her usual affairs of life, was taking gymnastic exercises, and had been quite well since. During the early part of January, 1913, she bruised the left breast; the skin which had been damaged by the rays became eroded and painful. I then referred her to Dr. Warmuth for excision of the breast. The axilla was not opened, because we believed the rays had sealed this glandular area. Pathological study by Dr. Eugene Case, confirmed by Dr. Joseph McFarland, showed no evidence of malignant disease anywhere, but showed pigmentation and necrosis of the skin and chronic diffuse fibrosis of the breast.

The results in this patient seem to be most striking and indisputable. The carcinoma of the right breast, with metastasis, was thoroughly removed, and upon microscopical examination proved to be an undoubted case of malignant disease. The disease recurred at once, and no one doubted the recurrence. All this recurrence disappeared under the action of the rays. The disease in the left breast increased rapidly after amputation of the right. No one doubted its

malignant character. Under the action of the rays, the clinical signs of the disease disappeared, and subsequent amputation of the breast showed neither microscopic nor macroscopic carcinoma.

CASE 9. Mrs. W., age 35, referred by Dr. E. B. Rogers. The patient had had her right breast amputated on account of carcinoma in May, 1908. At the time of beginning X-ray treatment there was induration of the tissues in the upper portion of the scar, and extending into the axilla, with enlarged, hard, adherent glands in the right supraclavicular region.

The patient was treated three times a week, and at the end of six months all evidence of recurrence and metastasis had disappeared. She remained well until April 27, 1911, when a tumor developed in the left breast. Both sides were then treated actively again, and she has remained well to date, which is nearly five years since beginning treatment for metastasis and recurrence.

CASE 10. Mrs. E., age 50, was referred to me by Dr. John B. Deaver on December 31, 1908. She had been operated upon for carcinoma of the left breast on November 17, 1908. She was given post-operative treatment, and remained well until May 24, 1909, when a small nodule developed in the upper portion of the scar. Dr. Deaver, who examined this, believed it to be malignant, and advised excision. Active treatment was applied by the rays to this nodule, and when she was taken to the hospital three weeks later Dr. Deaver could not find the nodule, and refused to operate. She has remained well to date, which is nearly five years.

CASE 11. Miss H., age 50, was referred by Dr. John B. Deaver, November 2, 1912. She had been operated upon for carcinoma of the breast by Dr. Deaver in June, 1911. She noticed a recurrence in September, 1912. When first seen by me there was a tumor the size of half a hen's egg, at the middle of the scar, firmly adherent to the ribs, and Dr. Deaver considered her inoperable. Under X-ray treatment this has completely disappeared; she has regained perfect health, and so far as we can tell she is well.

CASE 12. Mrs. D., age 65, was referred for treatment by Dr. J. W. Schaffer. She had had an attempted removal of carcinoma by a caustic. When this was unsuccessful she had radium applied, having 48 hours' exposure to radium in all. Nothing was done for a year, during which time the recurrence developed in the breast, in the axilla fold, and in the supraclavicular region. When applying for treatment by X-ray she had a mass in the left axilla one-half the size of her hand, firmly adherent, hard and painful. Under X-ray treatment this has completely disappeared, and to all outward appearances she is well.

CASE 13. Mrs. E., aged 49 years, was referred to me by the Rev. Russell H. Conwell, July 27, 1908. She had been operated upon for carcinoma of the left breast five years before, at one of the leading hospitals. At that time the tumor was said to be the size of a walnut, and was excised. Recurrence developed within two years. When she came to me the tumor tissue involved the entire mammary region, with axillary and supraclavicular involvement. The mass was so large that it left the impression on my mind of an extensive primary growth. It was a hard, painful, adherent nodular mass, ulcerated at several places. It was so far advanced that I wrote to Doctor Conwell that I believed nothing would be accomplished. In the absence of any other hope, I treated her with the rays.

In a month the mass of tumor tissue was reduced to half, and the ulcers were healing. In two months it was reduced to a third, the ulcers were healed, and in three months no tumor could be palpated. There remained, however, a puckered central scarlike mass of tissue, about one-half inch in diameter, which was freely movable, and which was not painful. I believed there was no malignant tissue present, but I feared that later this mass would undergo degeneration and accordingly referred her to Dr. W. Wayne Babcock for operation, January 18, 1909.

I believed that only a local excision was necessary, but Dr. Babcock did a complete operation. Pathological examination of the specimen by Dr. Duncan showed some evidence of malignant disease. She was sent back to me in six weeks, when both Dr. Babcock and I felt a hard nodule in the supraclavicular region, about the size of a pea. This was reduced under treatment to one-eighth of an inch, and has since remained stationary. About a year ago a hard nodule one-half inch in diameter was discovered in the right axilla. This has decreased in size, but has never disappeared. At first the patient was treated daily, then less often, and during the past three years she has been seen once a month for the purpose of keeping her under observation. In the four and a half years she has had seventy-six applications of the rays. The left mammary area shows marked telangiectases.

This woman was clearly inoperable when referred to me for treatment because of the extent of the disease, and seemed hopeless even in my estimation. The disease had practically disappeared in three months. The puckered scar was then removed. Her general health improved immediately, and during three and one-half years she has felt and looked perfectly well. The fact that the disease was recurrent and metastatic makes the result all the more convincing.

CASE 14. Mrs. T., aged 38 years, referred to me by Dr. Samuel Johnston and Dr. Ernest Laplace, January 8, 1909. Tumors had been noticed in her breasts eight years previously. They gradually increased in size and secondary nodules developed under the anterior axillary fold.

At the beginning of treatment there was a mass, one and a half inches in diameter, in the lower outer quadrant of the left breast, and one two and a half inches in diameter in the upper and outer quadrant, with a small nodule under the anterior axillary fold. Both were hard, nodular and adherent. There was a similar tumor in the right breast, one and a half inches in diameter, in the lower inner quadrant. She was considered inoperable because of the extent of the disease. She was treated three times a week at first. During the past three years she had been seen once or twice a month, partially for treatment and partially for observation. In all she had been treated one hundred and fourteen times. The tumors were reduced to a fibrous mass about one-half inch in diameter, freely movable, and not tender. Her general health had at no time been interfered with, and in general appearance she looked perfectly well.

The treatment was carried to the point of producing an erythema, several times, and as a result the skin was atrophic and showed a number of telangiectases. This patient was living and symptomatically well, over four years after she was referred with carcinoma of both breasts with metastasis. She had suffered no inconvenience except that of coming for treatment.

CASE 15. Miss G., aged 37 years, was referred to me by Dr. John B. Deaver, July 14, 1911. A carcinoma had been growing in the right breast over three years. In September, 1910, she was taken to Dr. Deaver by Dr. George Miller, for operation, but at that time the disease had advanced so far that Dr. Deaver considered operation inadvisable. Ten months later, when the carcinoma had become an ulcerating mass, she was taken to Dr.

Deaver again, at which time he referred her to me. She then had an ulcerating tumor about four inches in diameter, adherent to skin and ribs, with several small metastatic nodules about the tumor. There were enlarged glands in the axilla and the supraclavicular region. She suffered from severe pains.

Under treatment the ulcer gradually healed, the tumor tissue disappeared, and even the scar tissue became movable upon the chest wall. There was no definite evidence of disease in this area for about a year. (In these patients, it is difficult to decide just when the disease has all disappeared.)

About May 1, 1912, a tumor developed in the upper and outer quadrant of the left breast. She was sent to Dr. Deaver, May 18, 1912, to have him see the result in the right breast, and to confirm the diagnosis of carcinoma in the left breast. The tumor in the left breast had nearly disappeared, and in its place was some increased firmness, which, I believed, was due to fibrous tissue. She had two hundred and six applications of the rays in all, counting both sides.

During all this treatment she improved in general health; pains were relieved; and she increased in weight and strength. There were, of course, some atrophy and telangiectases of the skin on the right side. After two or three years, this is likely to degenerate and become necrotic. If so, and there is no carcinoma present, excision and skin grafting should be done.[1]

This patient was clearly inoperable because of the extent of the disease. The disappearance of this advanced disease in the right breast under the action of the rays gave encouragement toward further effort, when signs of carcinoma developed in the opposite breast nearly a year later. The relief of the symptoms in the second breast shows that good results may at times be obtained even in a patient with a pronouced constitutional tendency.

TECHNIQUE

The technique of the application of the röntgen rays in my experience in the treatment of the metastatic and recurrent carcinoma, upon which this paper is based, has, of course, passed through the various stages of the development of röntgen therapeutic technique, from the very small and superficial doses, often repeated and unfiltered, to the present larger doses of filtered rays, applied less frequently, but more thoroughly, and from as many directions as possible. Therefore, as would be expected, good results are more frequent at present than formerly.

1. A thorough examination of the patient is necessary to determine the extent of the disease. This will require careful inspection and palpation of the entire chest and glandular regions, and generally a röntgen examination of the chest.

2. Having determined the extent of the disease, the skin is divided into as many areas as possible, through which the rays may be directed to the deepest area of disease. This division should not be so much subdivided as to waste energy. Generally I apply the rays from four or five different directions, the anterior axillary and mammary, the posterior axillary and scapular, the axillary and the supraclavicular. In this way the deeper portions of the disease, especially the mediastinal glands, are reached by each application. The areas of skin not directly exposed should be protected by layers of lead foil, or some opaque material.

3. The exposed skin should be protected by filters. For this I originally depended upon leather, one-eighth of an inch thick (first recommended by me before the American Röntgen Ray Society, September, 1905), which I found gave considerable protection. To this I now add from one to four millimeters of aluminum. These filters are placed about one-half inch from the surface of the tube, and between the tube and the patient. In this way the filters never touch the patient and are never soiled. In my apparatus they occupy the top of the diaphragm of the protected tube holder.

4. The quality of rays should be sufficiently penetrating to carry a good proportion to the deepest part of the disease, and should be from 6 to 8 as measured by the Benoist scale. Great difficulty is usually encountered in keeping the rays emitted by the tube of a uniform quality. For this, I have found the water-cooled tubes most efficient, when kept uniformly cooled by a constant stream of water flowing through the cooling chamber.

5. The dose should be carefully measured and the erythema limit should not be exceeded. For this purpose the Sabourand pastilles have served me best. The treatment should be carried to this limit as quickly as possible in each area. After the erythema dose has been gone over, any particular area treatment should not be repeated at this point for at least two weeks. The interval during which one should wait will have to be increased with each repetition.

CONCLUSIONS

I have selected for study the above fifteen cases because they were rather striking examples of what can be at times accomplished, and it would seem to me that we can draw the following conclusions:

1. That the application of the röntgen rays will at times cause a disappearance of both small and extensive areas of both recurrent and metastatic carcinoma.

[1] Cases 8, 13, 14, and 15 have been previously referred to in a report upon "Inoperable Carcinoma of the Breast." N. Y. M. J., 1913, April 26.

2. That the disease can at times be made to disappear when it covers the greater portion of the chest.

3. In at least one case there seemed to be produced some constitutional condition which led to the rapid disappearance of carcinomatous tissue that had not even been exposed to the rays.

4. The additional administration of thyroid extract in small doses seems to aid materially in the cure of the disease.

5. The disease should be treated as actively and with as large doses as circumstances will permit, using every possible means for the protection of the skin.

6. Since the above cases prove that extensive recurrent malignant disease can be made to disappear, the best time to treat with the rays is immediately after operation when least disease is present. This post-operative treatment should be thorough and given with the same care that would be used with palpable disease.

HÆMOSTASIS IN CRANIAL SURGERY

By L. H. LANDON, M. D., Philadelphia
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NO single factor in the technique of neurological surgery, particularly that involved in exposing the brain, is more important than the proper and efficient control of hæmorrhage. The extreme and peculiarly constituted vascularity of the scalp, the presence of the emissary venous sinuses varying in their size and position, the large vascular lacunæ in the diploë, the vessels entering the skull through their bony canals for the supply of internal structures, and lastly the delicate and intricate network of vessels incorporated in the meninges, all present varying and trying problems to the surgeon and are a source of constant danger to the patient.

Unless the armamentarium of the surgeon contains the proper mechanical agents and unless he has the experience and judgment to cope with this troublesome phase, the often alarmingly profuse hæmorrhage will be a constant source of annoyance during the operation and a menace to the life of the patient, for whom the prognosis would otherwise be good.

It is the purpose of this paper to review those measures which have been found most efficacious by those having the largest experience in cranial work and to describe the tourniquet which I devised and had made for the use of Dr. Charles H. Frazier, in his service at the University Hospital.

The exceedingly free blood supply of the scalp renders control of hæmorrhage much more difficult than elsewhere on the body surface. This is due not only to their number and free anastomosis but to the peculiar anatomical arrangement of the blood-vessels in the tissues. Five large trunks enter the scalp on each side, the frontal and supra-orbital in front, the superficial temporal and posterior auricular laterally, while posteriorly, the large occipital artery approaches between the borders of the sternomastoid and trapezius muscles. These vessels break up into an enormous number of branches which anastomose with one another and with their fellows of the opposite side in a remarkable manner.

The venous return is even more complicated, as the free communication between the veins and the diploic circulation renders hæmorrhage from this source quite as profuse and difficult to control as that from the arterial side.

The skin of the scalp is one of the densest in the body. In its deeper layers and in the tough unyielding fascia which binds it to the aponeurotic layer beneath, is the major portion of the blood-vessels. The tough surrounding tissue not only prevents contraction and retraction of their cut ends, but makes grasping the severed vessels with ordinary hæmostats and ligation usually impossible.

The vascularity of the other layers of the scalp is very meager and presents no difficulty in its control.

Control of the superficial hæmorrhage: This is a much simpler matter in those operations on the vault than in those at or near the base of the skull. Among the latter may be mentioned operations for exposure of the gasserian ganglion, subtemporal decompression, the MacArthur-Frazier route to the pituitary, and exposure of the cerebellum.

The posture of the patient has a distinct effect upon the freedom of the hæmorrhage. The semi-sitting posture at an angle from 45° to 60° is not

only a definite controlling factor in the bleeding but offers the most advantageous position for the convenience of the surgeon in exposing the deeper structures. This position can always be obtained except in those procedures on the posterior fossa where the patient must be placed face downward. Here a specially constructed table which will allow elevation of the head without displacement of the field of operation to an inconvenient height is of advantage. Of course, with the patients in these positions, a constant record of blood pressure is essential. If this falls to a dangerous level, the more nearly horizontal position is immediately assumed. It is always interesting to note the almost immediate effect this change in position has upon the venous bleeding from the wound.

The state of and the nicety in the administration of the anæsthetic will also greatly aid or delay the surgeon in the control of bleeding. A half-anæsthetized, cyanotic patient or one whose respiratory passages are constantly filled with mucus is always a menace; the resulting intense congestion of the veins often causing furious hæmorrhage. The use of the intratracheal or the intrapharyngeal insufflation methods of anæsthesia has greatly facilitated the nicety and the uniformity with which the patient is kept under the influence of ether.

The most convenient means of controlling scalp hæmorrhage in those operations where it is applicable, i.e., those on the vault, not at or near the base, is some form of encircling tourniquet. There have been many devices for this purpose: rubber tubing, a modified Petit's tourniquet, and pneumatic tube incased in metal jackets on the outside, by the inflation of which the desired pressure could be obtained. They are, however, all more or less cumbersome, difficult to apply, maintain in position and remove, while the presence of rubber in their construction renders them very short-lived when frequently sterilized as is necessary.

To overcome these disadvantages and to obtain an instrument consisting entirely of metal, our tourniquet was devised. It consists of a thin flexible spring-steel encircling band, 14 mm. wide and about the thickness of the ordinary steel tape measure. It is broken fore and aft. Posteriorly there is a sliding joint controlled by a strong coiled spring. This spring in no wise measures the amount of pressure exerted by the band, as the friction between the band and the gauze covering the head prevents slipping of the tourniquet and hence strain upon the spring during any safe constriction. Its action, then, is simply that of a safety valve. Anteriorly is the self-locking lever ratchet by which the band is tightened to any desired pressure. Laterally there are two sliding adjustable auxiliary springs which lie over the temporal fossæ for added pressure over and control of the temporal arteries. There is also a detachable and adjustable steel band which passes from the midline in front along the line of the longitudinal sinus to a like point in the rear and prevents displacement of the tourniquet downward. When the instrument is properly applied, however, with adequate pressure, the use of this strap will seldom be necessary.

To apply the tourniquet, the head is covered with three or four layers of sterile dressing gauze, the band, previously sterilized, is slipped over the head until it rests on a line passing just above the ears from the glabella in front to just below the inion behind. The temporal springs are now slid to their proper positions and the slack taken up through the sliding joint in front. The hook of the lever is now inserted into one of the catches, three or four holes from the midline, and the lever snapped shut, which draws the band tight. After a little experience, one can accurately estimate the amount of constriction necessary for hæmostasis by the force required to shut the lever.

When it is desired to remove the tourniquet the lever is raised, the band springs open and it is lifted from the head. The instrument being entirely of metal is practically indestructible, can always be sterile and may be readjusted, tightened or loosened to any desired pressure or removed at any time during the operation with ease and without fear of contamination. Caution should be taken that this or any other tourniquet is applied with sufficient pressure to occlude all the arteries, else it will be worse than useless by shutting off the venous return only, causing intense congestion and greatly increasing the hæmorrhage.

There is at least one condition which also renders the use of a tourniquet disadvantageous. In some cases of large cortical cerebral tumors, the normal communications between the internal veins and sinuses of the skull and those in the scalp is so greatly exaggerated that occlusion of the latter only increases the flow of blood from the scalp wound. This is particularly liable to happen when the tumor is of the very vascular and malignant type. Here recourse for control of hæmorrhage must be had to digital pressure by an assistant to either side of the wound until the bleeding points may be caught, or better, the edges of the scalp grasped by some one of the forms of scalp clamps. Of these clamps there are many, but the Allis hæmostat serves every pur-

Fig. 1. Showing sitting posture; anterior view of tourniquet applied, showing the self-locking catch in front.

Fig. 2. Illustration showing proper position of patient; lateral view of tourniquet applied, adjustable headrest, and intrapharyngeal method of anæsthesia. Note the additional pressure over the temporal arteries.

pose, is quickly and easily applied, and there is not the danger of injurious traumatism to the tissues as with some of the other models. In some of these cases the loss of blood may be so great, even before the dura is exposed, as to necessitate postponement of the operation to a second sitting. In some the question of ligation of one or even both carotid arteries may be considered. This is not often necessary, however, and when done should be by means of a temporary ligature or metal clamp, which should be removed or partly released upon the development of any signs of deficient cortical circulation sufficient to cause motor or sensory disturbances.

It is seldom that a ligature need be applied to the scalp wound: the tourniquet or the hæmostats are left on until the end of the operation, are then removed and the wound closed with deep interrupted sutures of silkworm gut; the sutures passing beneath each bleeding point, when tied, will usually sufficiently control all bleeding.

There are many other methods of controlling scalp hæmorrhage, among which may be mentioned the hæmostatic safety pins of Vorschutz, Kredel's hæmostatic sutures, the clamps of Hudson and Tate, and deep backstitch running sutures circumventing the wound. All are of use in those procedures not permitting the use of the tourniquet, the backstitch especially in suboccipital craniectomies where it is run along the line of the superior occipital ridge from one mastoid process to the other. The suture is carried down to the bone, each stitch overlapping the other about half, and drawn sufficiently tight to occlude the vessels.

Control of the deeper hæmorrhage. The superficial bleeding having been controlled, the surgeon is next met with hæmorrhage from the bone. This occurs from several sources, the emissary veins and sinuses which may be greatly increased in number and size, the diploic veins, or from the middle meningeal artery when the field of operation includes the sphenoparietal region. Bleeding from the emissary veins is seldom difficult to control, often ceases spontaneously, or their orifices are plugged with Horsley's wax. Certain of these channels should, however, be borne in mind, when operating in the occipital region. There are usually two or three large foramina, chief of which is the mastoid, lying one and a half to three centimeters inside the mastoid process, and which communicate internally with the lateral and sigmoid sinuses and externally with the occipital

veins. There are also several nearer the midline which spring from the occipital sinus. Hæmorrhage from these sources may be shockingly profuse in a very short time, sufficient to endanger the life of the patient if not controlled, but this is usually easily done with wax, although plugging with wood or bone pegs may be necessary.

Bleeding from the diploë is usually of no moment; the use of the Cryer spiral osteotome for cutting out the osteoplastic flap aids greatly in its control both by the heat of friction and the plugging of the sinuses with the fine bone dust.

In some procedures where the dura has to be raised from the base of the skull for exposure of deeper structures one may encounter some hæmorrhage from the torn dural vessels entering the inner aspect of the bone. As a rule, however, this is very slight, although in the older operation of gasserectomy it was often severe when the ganglion was raised. This danger and that of injuring the cavernous sinus has been practically eliminated by the Spiller-Frazier method of avulsion of the sensory root. In this operation, the only bleeding of moment comes from the middle meningeal. This artery is deliberately cut as it enters the skull through the foramen spinosum and the foramen immediately occluded with Horsley's wax. This is usually sufficient; but if not, its orifice may be plugged with a wood peg conveniently whittled from a swab stick.

Bleeding from the external surface of the dura itself is seldom serious in quantity but may be very persistent. The larger vessels are ligated with the finest silk, the ligature carried around the bleeding vessel on a fine curved needle. Care should be taken while doing this not to wound any of the underlying pial vessels. Other persistent points of bleeding in the dura are stopped by the application of bits of gauze or cotton wrung out of boiling saline solution or by the application to the point of a bit of muscle tissue, easily snipped from some of the exposed muscle. This latter method, whose action is physiological, was first used by Sir Victor Horsley for this purpose and is most satisfactory. The muscular graft is not removed but closed in the wound.

It is seldom necessary to encroach upon the larger sinuses of the dura. As a matter of caution, however, mention should be made of the deviation of the superior longitudinal sinus toward the right as it passes backward. Posteriorly, therefore, operations can be carried farther toward the midline on the left side than on the right. In the parietal regions also it should be borne in mind that the pacchionian bodies are not only more numerous but are farther from the midline and are surrounded by large vascular lacunæ offshoots of the longitudinal sinus. If these should be wounded accidentally, the application of muscle grafts and inaction — unless the hæmorrhage be dangerous—is the best policy, the bleeding often ceasing spontaneously if the dura is not pressed away from the bone. If more vigorous means are indicated the overlying bone must be rongeured away and the sinus ligated on either side of the rent with fine silk.

The greatest care should be taken to avoid hæmorrhage from the pial vessels. The dura is opened along a grooved director and the manipulations of the cortex must be most delicate. If deeper exploration of the brain be indicated, the overlying pial vessels are ligated on either side of the proposed wound. For this the very finest silk mounted on a fine curved needle is employed. Serious hæmorrhage from this source is usually the result of bungling or harshness. It may, however, be unavoidable and very profuse in those cases of cortical tumors of a malignant type which are on or near the surface. Heat by means of the hot saline solution in cotton and also muscular tissue is of use here as in the dural bleeding.

Notwithstanding all the care and precautions that may be taken, hæmostasis at the end of any cranial operation is seldom perfect and it often becomes necessary to institute drainage for the first few hours following the operation. For this purpose, strips of rubber tissue are the best. In more profuse bleeding, a small rubber tube may be used, or strips of gauze. When the latter is used, it should be wrung out of sterile liquid petrolatum which prevents adherence of the gauze to the tissues and recurrence of the bleeding when the drainage is removed. Usually the drain should be brought out through a counter opening at the lowest angle of the wound; it should never be left in over twenty-four hours and is preferably removed in from fifteen to eighteen, the opening then covered with a wisp of cotton moistened with 5 per cent iodine solution. When the condition of the patients warrant, they are always placed in bed in the sitting posture as soon as they are out of ether. This greatly assists in the prevention of or the continuance of hæmorrhage.

For knowledge in the practical application and use of these methods of hæmostasis, I am greatly indebted to Dr. Charles H. Frazier, whom it has been my privilege to assist in a considerable number of these cases.

FRACTURE OF THE LOWER ENDS OF THE TIBIA AND FIBULA[1]

By A. R. COLVIN, M. D., St. Paul, Minnesota

My excuse for bringing so familiar a subject before you is that I am convinced that the classifying of nearly all of these injuries as Pott's fractures has led to confusion in treatment. The surgeons of preradiographic days were undoubtedly possessed of a high order of clinical observation, but the more one sees of radiographs of injuries in this region, the more one speculates as to the amount of error there must have been in the interpretation of clinical pictures, by even expert clinicians.

In Treves' Surgery, for instance, it is stated that Pott's fracture is the most frequent of all fractures at the lower end of the leg.

The radiographic study of fractures, while widening our possibilities of clinical interpretation, also convinces us of the impossibility of arriving at clinical conclusions under certain conditions, unless such a conclusion should be that we cannot know.

The fact that the best clinical powers are bound to err furnishes an explanation why the fractures under discussion, being so freely interpreted as Pott's fracture and treated accordingly, should inevitably lead to bad results.

That the end-results of treatment are not satisfactory in a large number of cases is evident, when one reads a report of any considerable number of fractures.

Malineus[2] says that the result is far from satisfactory in fully one-third of the cases.

The failure to treat Pott's fracture by the approved method is as serious an error as it is to treat a variety of lesions by this method.

Pott's description of the fracture which bears his name was a fracture of the fibula, about three inches above the ankle-joint, combined with a rupture of the internal lateral ligament (Fig. 1).

Dennis' System of Surgery, Treves' System of Surgery, and Agnew's Surgery are the only works in English where I have found the original description adhered to. Nearly all other authors, while agreeing that it is unsafe to lump all these injuries under one heading, nevertheless illustrate with radiographic reproductions, various injuries as Pott's fractures, and then, with few exceptions, emphasize the inversion treatment.

My own observations and perusal of illustrated literature on this subject convinces me that Pott's fracture, in the strict sense, is a rare injury.

Meissner,[3] reporting 211 cases of injury to the lower end of the tibia and fibula, in the Klinik of von Bruns, occurring since the advent of the radiograph, classifies them as follows:

Fracture of —	No. Cases
1. The external malleolus, or of the fibula above the joint	51
2. The internal malleolus	7
3. Both malleoli	100
4. Supramalleolar	30
5. Epiphyseal separation	11
6. Tibial articular surface	3
Total	211

Meissner says that in pronation fractures he frequently saw a tearing, partial or complete, of the internal lateral ligament, with fracture of the external malleolus.

In a series of 60 cases occurring in the City and County Hospital, Saint Paul, in the services of all the attending surgeons, the lesions were as follows:

	No. Cases
1. Fracture of the external malleolus, or of the fibula above the joint	16
2. Fracture of the internal malleolus alone	4
3. Fracture of both malleoli	27
4. Fracture of internal malleolus, and of the fibula above the joint, combined with backward dislocation of the foot	3
5. Fracture of the internal malleolus, and a splitting off of a considerable triangle of bone from the tibia, at the tibia fibular junction	1
6. Split fracture of the tibia, at the tibiofibular junction, of minor degree, with no separation (no other fracture)	1
7. Comminution of the articular surface of the tibia	1
8. Supramalleolar fracture	6
9. Fracture of the fibula, and rupture of the internal lateral ligament	1

In the bimalleolar fractures there were two backward dislocations of the foot, one outward dislocation of the foot, one case with splitting off of the anterior margin of the articular process of the tibia, and one of the posterior margin of the same process.

It will thus be seen that in my list of sixty cases, Pott's fracture, in the semi-strict sense, occurred only once. However, if we allow a tearing off of a liberal amount of the internal malleolus to come within the definition of Pott, this did occur in a number of cases.

[2] Deutsche Ztschr. f. Chir., cxx.

[3] Beitr. z. klin. Chir., lxii.

[1] Read before the St. Louis Medical Society, March 29, 1913.

Fig. 1. Pott's fracture diagrammatic.

Fig. 2. Anatomy of the ankle joint, showing the foot suspended from the malleoli by the lateral ligaments. It can be readily seen how fracture through the malleoli will make it easy for adduction and abduction to take place at the seat of the fracture.

Displacement of the astragalus, that is, of its upper lateral edge between the fibula and tibia, I did not see in my list of cases, except in a small number of bimalleolar fractures. Fracture of the fibula above the joint, combined with displacement of the upper lateral edge of the astragalus between the fibula and tibia, as a result of a tear fracture, is spoken of as Dupuytren's fracture.

While conscious of the evils that may result from a failure to recognize and reduce the various dislocations of the foot, complicating the injuries

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 3. The deformity caused by treating bimalleolar fracture in the adducted position.

Fig. 4. Fracture of the fibula, at the tibiofibular junction, and tearing of the internal lateral ligament, with displacement of the foot outwards.

Fig. 5. Bimalleolar fracture with the internal malleolus broken in two places. Showing also the eversion or valgun deformity, due to non-correction of the displacement.

under discussion, it is my main purpose to call attention to the necessity for maintained adduction as a retention dressing in the true Pott's fracture, and to the evils resulting from maintained adduction as a retention dressing in other commoner fractures.

It may be well to recall the fact that there is practically no movement in abduction or adduction at the ankle-joint, these movements taking place in the mediotarsal and subastragaloid joints. Adduction is always accompanied by inversion or supination, and abduction by eversion or pronation of the foot. The foot is connected with the malleoli by the powerful lateral ligaments of the ankle-joint (Fig. 2).

In the true Pott's fracture the foot has lost its anchorage to the internal malleolus, either by rupture of the internal lateral ligament, or if we will, the tip of the internal malleolus, and a marked outward displacement of the foot is produced (Figs. 1 and 4).

Inasmuch as the internal lateral or deltoid ligament extends from the internal malleolus to the os calcis and scaphoid bone as well as to the astragalus, marked adduction must be maintained, after reducing the deformity, thus approximating the torn structures on the inner side of the foot during healing.

If we recognize Dupuytren's fracture as a separate lesion, then adduction is indicated here, for the purpose mentioned, and also to hold in apposition the lower tibiofibular separation. If this position is not maintained, we get in Pott's fracture a lengthening of the internal lateral ligament, and when weight bearing is resumed, a resulting pronated foot, which is the weakest position of the foot, and a very disabling one. Even after weight bearing is resumed it is well to have the inner side of the shoe raised, to still throw the tension on the structures at the outer side of the ankle, and relieve the tension of those on the inner side. Marked adduction in this fracture cannot do any harm, because the fracture of the fibula is above the tibiofibular joint, and the upper end of the lower fragment being anchored to the tibia by the interosseous membrane, any inward tilting of the external malleolus is impossible, without tearing the interosseous membrane. Adduction, moreover, will have a tendency

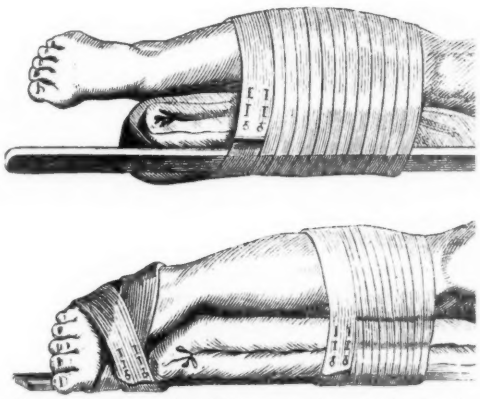

Fig. 6. Dupuytren's splint commonly used for Pott's fracture — the use of this splint in malleolar fractures would surely cause deformity — it is indicated in true Pott's fracture.

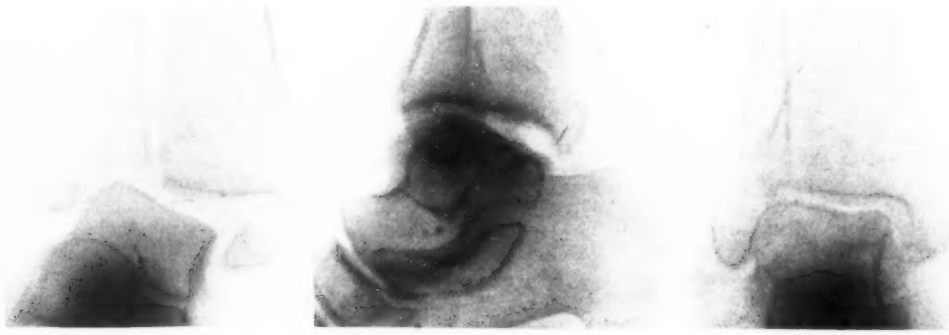

Fig. 7. Fig. 8. Fig. 9.

Fig. 7. Bimalleolar fracture with outward displacement of the foot and forward subluxation of the foot (see Fig. 8). This foot could be swung in either direction, the movement being through the seat of fracture.

Fig. 8. Showing forward subluxation of the foot (see Fig. 7).

Fig. 9. The fracture shown in Fig. 7, after reduction, abduction or adduction of the foot would correspondingly displace the malleoli.

through the pull on the fibular tip to draw the upper end of the lower fragment outward away from the tibia, whence it has been thrust by the original abducting force.

If the inward displacement of the upper end of the lower fragment is difficult of dislodgment, it might be caught by a pair of tenaculum forceps, and thus drawn outwards.

According to the two lists herein referred to, fracture of both malleoli, at the level of the tibiofibular junction, is by far the the most frequent injury, and it is in this lesion that forcible adduction can do the most harm (Fig. 3).

Moderate adduction of the foot, or such adduction as takes place normally in the joints referred to above, does not have any corrective action upon displaced malleoli. It is only after the normal limit is reached that a continuance of the force will pull, or as it were, rotate the fragments into position. Frequently this can be accomplished more accurately by shoving, rather than rotating.

There should be a distinct understanding in speaking of adduction, in the treatment of these fractures, as to whether it is used as a corrective force, or whether after correction of displacement, adduction within the limits of the joints concerned in this movement is maintained.

The main ligamentous attachments of the foot to the leg being by the two lateral ligaments, in bimalleolar fractures, the foot will be hung as by hinges, at the seat of the breaks, and inversion of any forcible kind will swing the malleolar fragments inward (Figs. 2 and 3). Consequently, accurate replacement of the fragments, and retention with the foot at a right angle without any lateral or medial deviation, is imperative (Figs. 7, 8 and 9).

If the injured member is seen after swelling has taken place, it is very difficult to differentiate the various lesions of this region. With many of them, a dislocation of the foot is possible, and comparatively frequent, and easy of reduction.

With the exception of the types with comminution of the articular surface of the tibia, or a splitting off of the anterior or posterior lip of the articular surface of the bone, reduction is usually easy, and if correct, and if proper retention is maintained, the result is in the majority of cases satisfactory. With comminution of the articular surface, it is impossible to be sure that the fragments have been properly replaced, except by operative measures. Whether this is necessary must be decided in each case by the amount of disability likely to occur. Where the anterior or posterior lips of the tibial articular surface are split off and displaced, reduction of the fragments has been impossible in my hands. The foot, however, can usually be brought to a right angle with the leg, and I have waited for some months before deciding whether it was necessary to remove a piece of bone obstructing dorsal flexion, for in some of them the result has been quite satisfactory without such removal.

SUMMARY

1. The lesions occurring at the lower end of the tibia and fibula are very varied in character, usually requiring the radiograph for differentiation, and as a guide to treatment.

2. Pott's fracture, as he described it, is very rare.

3. The most frequent lesion is a bimalleolar fracture, and the commonest deformity is that of the everted foot.

4. The various lesions are produced by a predominating everting or inverting force.

5. These forces used as corrective measures in either direction may result in the production of a deformity, the opposite to the one caused in the original injury.

6. Adduction or inversion of the foot is not necessary as a retention dressing, except in Pott's fracture, and if used in bimalleolar fractures is very liable to result in deformity.

7. The original inverting or everting force which fractured one or both malleoli may have spent itself before displacement of the malleoli has occurred, and any subsequent force applied in either direction will cause an eversion or inversion deformity.

Honor should be done to Pott by limiting the use of his name to the fracture which he accurately described, and as radiographic observation proves that this is a rare fracture, it is all the more honor to him that he recognized in the preradiographic days this rare lesion.

AN IMPROVED METHOD OF HÆMOSTASIS IN SHOULDER- AND HIP-JOINT AMPUTATIONS[1]

By WALTER A. NORTON, M. D., Savannah, Georgia

MANY attempts have been made in the past to control hæmorrhage in shoulder- and hip-joint amputations. It is a subject the study of which is both interesting and useful, and, according to the late Nicholas Senn, we must be free to admit that it constitutes by no means a closed chapter. A mastery of the technique of hæmostasis is an essential prerequisite to successful surgery. The presence of blood in a wound not only retards ideal healing, but also interferes with speedy work. "Extravasated blood is a dead substance, and must be so regarded by the surgeon." It is therefore incumbent upon every surgeon to adopt the simplest methods for making all operative fields as bloodless as possible. It might be well to delve into the history of these subjects and note the various steps which have led up to the present methods.

The first hip-joint amputation performed in America, and the first successful one in the world,[2] was done by Brashear of Bardstown, Kentucky, in 1806. He amputated the thigh of a colored boy in the lower third, and then enucleated the femur through a long external incision.

Bloodless amputations of the shoulder and hip were first attempted by making compression upon the aorta near its bifurcation. Pressure was exerted upon the abdominal wall, the vessel being interposed between the wall and the spine. Tourniquets for the purpose were devised by Esmarch, Tiemann, Lister and others, but the method was soon abandoned because of the immediate risk to life. Later in hip-joint amputations Davy sought to control hæmorrhage by introducing a blunt rod of wood or metal into the rectum and directing pressure upon the common iliac. The directions given by Davy were as follows:

"Oil having been injected into the bowel, the conic end of the rod is introduced into the rectum and passed in the direction of the vessel to be compressed, the surgeon feeling the end of the rod through the abdominal wall, directing it to the common iliac as it lies upon the pelvic brim. The handle is now carried to the opposite side and raised so that it may act as a lever, the anus serving as a fulcrum." This also was unsatisfactory, and preliminary ligation of the common femoral or external iliac for hip-joint, and subclavian or axillary for shoulder-joint was advocated, but not until the surgical genius of Esmarch introduced the elastic bandage was any decided advance made in this line. Following the general use of the Esmarch bandage Jordan Lloyd advocated controlling hip-joint hæmorrhage by compressing a calico roller bandage over the external iliac, retaining it in position by pinning it to a black india rubber bandage two yards long. "The center of this bandage rested between the tuberosity of the ischium and the anus, and the ends drawn tight were held by an assistant at a point corresponding to the center of the iliac crest of the side to be operated upon." Finally, in 1889, Wyeth devised a bloodless operation for amputation at the shoulder by elastic constriction over the scapula and pectoral region, and at this operation the applicability of this same idea to hip-joint amputations occurred to him, and in less than a year he performed his first bloodless amputation at the hip. He advocated, as you all know, the use of ordinary mattress needles ten inches long, introduced in the following manner:

For the shoulder, the first needle was introduced at the middle of the anterior axillary fold and brought out an inch external to tip of the acromion process. The other entered at the middle of the posterior axillary fold and emerged an inch external to tip of the acromion process. For the hip-joint amputations, the first needle was introduced one-fourth of an inch below the anterior superior spine of the ilium, and traversed the tissues for three inches emerging on the outer side of hip—direction being at right angles to plane of body. The second needle was thrust through the skin and tendon of origin of adductor longus half an inch below crotch, and emerging an inch below the tuberosity of the ischium.

The method of Wyeth seemed to solve the problem and had an extensive use in this country and Europe, the death rate falling from hip-joint amputations, according to Wyeth's paper,[3] from 93 per cent to between 40 and 50 per cent.

There are five points of importance which I would mention in shoulder-joint amputations:

[2] Bryant and Buck's Surgery, Vol. iv.

[3] J. Am. M. Ass., 1910, April 16.

[1] Read before the Medical Association of Georgia, Section on Surgery, Savannah, Georgia, April 17, 1913.

1. Ordinary compression of Esmarch bandage around shoulder without the use of Wyeth's needles, or some other method which will hold the tourniquet absolutely in position is not at all certain, because the rubber tourniquet will invariably slip down into the groove below the acromion process and cause such pressure as to greatly interfere with disarticulation.

2. It will also cause diminished pressure by slipping and give rise to embarrassing hæmorrhage after the operation is well under way.

3. In any of the accepted methods of operation either in the deltoid "U" flap, anterior racquet or double flap, place the ligature below the origin of posterior circumflex in tying the axillary, for this vessel furnishes nourishment for the flap, which if destroyed might seriously impair its vitality.

4. Allow no air to enter the axillary vein when tying, as it may give rise to air embolism.

5. In all methods, skin incision should be made and dissected up slightly before carrying incision through muscles.

Finally, many text-books will tell us that the safest and best way to control hæmorrhage in shoulder-joints, as well as in hip-joint amputations, is to employ Wyeth's needles.[1] By a much simpler method we can perfectly control hæmorrhage in shoulder- and hip-joint amputations, as I have proved in several amputations done by me within the past eighteen months.

[1] Senn, International, etc.

Only within the past two weeks, and since this paper was first written, have I found in Binney's Surgery, 1913 edition, the barest mention of a slightly similar method advocated for use in shoulder-joint amputation only.

It seems almost incredible that the old method of Wyeth's needles is still recommended in the latest text-books,[1] when a simpler and less barbarous procedure will accomplish the same result. Thinking it may prove useful, I will explain a method which can be used absolutely without an assistant if desired, and will control hæmorrhage at the hip as well as at the shoulder. It is as follows:

A four-inch roller bandage and an Esmarch rubber tourniquet is all that is needed. The four inch bandage is made into a 3 or 4 ply strip two yards long and laid upon the chest, extending over the shoulder; another similar strip is held over the scapula, the Esmarch tourniquet is applied over these two strips and pinned to each one with safety pins. The strips are simply folded back and handed to the nurse, or can be tied under the opposite arm.

For hip-joint amputation an anterior strip of bandage is placed so that the outer border of the bandage touches the anterior superior spine of ilium, and the posterior one is placed so that the inner border of the bandage touches the tuberosity of ischium. Pull is exerted so as to keep the Esmarch snug in the crotch and in the groove below the anterior superior spine of the ilium. The bandage pulleys are now passed over the shoulder of the other side and handed to the nurse, or better still tied securely.

Many neoplasms, angioma, fibroma, sarcoma, carcinoma and keloid, occur in the shoulder; it is the most frequent site of lipoma.[1]

I maintain that in the above mentioned conditions this method is superior to Wyeth's needles or preliminary ligations for obvious reasons.

The advantages of this method are,

1. You always have a bandage at hand, and may not have Wyeth's needles.

2. You do not impair already lacerated tissues by introducing the needles, for these cases are nearly all traumatic and you are often sorely taxed to find tissue for a flap.

3. The assistant holding the bandage (if they be not tied) can exert pull above or below as you progress with your work and occasion demands.

4. By this method you do not open up fresh fields for infection, as you frequently have conditions that make asepsis difficult, and as you must necessarily do in introducing Wyeth's needles.

5. Any procedure which will shorten the time of operation, and thereby lessen shock, is desirable, and precision in planning little details which will contribute toward making surgery an exact procedure should be carried out.

[1] Bryant and Buck's Surgery.

[1] System of Surgery. v. Bergmann, Vol. iii.

A NEW DIAGNOSTIC SIGN IN INJURIES OF THE ABDOMINAL VISCERA[1]

By E. B. CLAYBROOK, M. D., Cumberland, Maryland

THERE is no condition that the physician is called upon to face that calls for better judgment, or causes him more anxiety, than those cases in which there is ground for the suspicion of internal injury. In these cases the surgeon is often at a loss to decide whether the conditions warrant an immediate laparotomy or a policy of watching and waiting.

In my experience, in this class of cases, I feel that if we wait for the classical symptoms to appear, the patient will be in such shape when operated upon that recovery will be the exception rather than the rule. Anything that can be brought forward to aid us in deciding this question will be of inestimable benefit to these unfortunate patients and a source of much gratification to the surgeon.

In a paper read at the one hundred and sixth annual meeting of the Medical and Chirurgical Faculty of Maryland, in 1904, entitled "Rupture of the bowel without external evidence of injury, with report of a case," I called attention to a symptom noted in that case as very prominent and noticeable. It consisted in the transmission of the heart and respiratory sounds, so that they could be heard all over the abdomen almost as well as over the chest. The ear was all that was needed to elicit the symptom, and if it was of any

[1] Read at the twenty-fourth annual meeting B. and O. Association Railway Surgeons, Pittsburgh, Pa., June 10, 1913.

special value it was doubly valuable on that account, for often the very life of these patients depends upon the attitude of the doctor who first sees them. At that time I stated that I did not know the mechanics that entered into the production of the sign, its value, or its significance.

In the past nine years I have looked for this sign, in all cases coming under my care, in which there was the slightest chance of an internal injury. After following these cases up closely, I have come to the conclusion that the sign is, when present, a positive indication for immediate laparotomy, whether the other signs present indicate grave trouble or not. It is present soon after the reception of the injury, and has been noted as early as a half hour after the reception of the injury. It continues in unoperated cases as long as twenty-four hours after injury, to my personal knowledge, and may last for days.

I believe that it is due to the irritation of the parietal peritoneum by the sudden outpouring of foreign material, as bowel content, blood and urine, into the abdominal cavity. It is never present in cases of extraperitoneal rupture of the bladder, or in injuries of the abdominal wall, without internal injury. I did not find it present in a case of rupture of the liver, in which the rupture was small, and down in the lobus Spigelii with the blood confined by liver, stomach, and omentum so that the parietal peritoneum was not flooded. In one case of severe bowel injury I failed to find it although the abdomen was full of blood. I do not know how to account for its absence in this case, and until we know more about it I think it wise not to look upon its absence as indicating no internal injury. I am positive that abdominal rigidity has no bearing on the production of the sign, as I have found it in perfectly soft, flaccid abdomens, as well as in those that were rigid. The fluid itself could not be responsible, for it is too little in amount in many cases, and besides fluids do not carry these sounds as well as gas, or the tissues.

I have found the sign present in cases of ruptured mesentery with hæmorrhage, ruptured spleen, ruptured bowel, ruptured liver, ruptured tubal pregnancy, and immediately after rupture of an appendix. It should be present in ruptured gastric and duodenal ulcer, as it is in cases of typhoid perforation. It should be of value in differentiating ruptured gastric and duodenal ulcer from appendicitis, as it will appear at once in these cases, and not in appendicitis until rupture has occurred. It is not present in post-operative cases. It was noted in one case doing badly after appendectomy, but as the patient was doing fairly well it was deemed best to watch and wait. After a week, the cul-de-sac being full and fluctuating, it was opened, and a large amount of blood and clot removed, due to a slipped ligature on the meso-appendix.

In a case sent in, with a history of a squeeze through the hips and abdomen, and catheter showing a small amount of bloody urine, the sign was not present. But with this history and the findings present it was thought safer to open him up. This was done, and showed no trouble intraperitoneally. The abdominal wall was severely contused, the space of Retzius contained some clot, and the bladder was contused, with a possible small laceration of the mucous membrane.

This sign is clear and distinct when it is present and can be elicited without any instrument whatever by anyone who has one good ear. I therefore think it should always be looked for, and when it is present the abdomen should be opened as soon as the patient can be moved to a hospital, or if that is impossible, or too time consuming, as soon as it can be done at home. The sign is not found in a slowly developing effusion, as in peritonitis or ascites. I hope that it will be followed up and some one will be able to find just what causes the transmission, and how much it can be relied upon as a negative as well as positive sign of internal injury.

HABITUAL OR RECURRENT DISLOCATION OF THE SHOULDER

Eighteen Shoulders Operated On in Sixteen Patients. A New Axillary Operation

By T. TURNER THOMAS, M. D., Philadelphia

CAPSULORRHAPHY for the cure of recurrent dislocations of the shoulder is gaining favor slowly, but much less rapidly than it deserves. It is an interesting fact that while a fairly thorough search of the literature showed the results to be almost uniformly favorable, a second paper by the same surgeon was not found. Various explanations could be offered for this fact, but they would all be included in the statement that the operation and its reported results lack the confidence of the profession. Perthes alone reported as many as four cases on which this operation had been done, most of the surgeons reporting cases having operated only once. Greater experience increases my confidence in the efficacy of the operation and throws new light on the etiology and pathology of the condition. The exposure of the capsule through an incision posterior to the axillary vessels has advantages which will probably increase confidence in the operation.

The frequency of these cases has not been established, even approximately, but they are undoubtedly much more frequent than previously thought. According to my experience, they are much more frequent than old unreduced dislocations, but much less obvious to other people, patients sometimes having the condition unknown to intimate friends. They are not prone to discuss freely their weakness, but would be glad of a cure. They are not anxious, however, to undergo an operation which is not well established and is not generally recommended. Burrell, who was one of the earliest in this country to do this operation, called it an anatomical operation. The occasional operator, without a good anatomical knowledge of the route by which the capsule is to be exposed, should not undertake it. With such a knowledge it becomes remarkably safe and very effective. The condition is merely a hernia of the joint, and the operation is, in my opinion, more safe and effective than the Bassini operation for inguinal hernia. How much violence a shoulder will stand after the operation has not yet been demonstrated, but the cases here reported show some interesting results in this respect. In one of my epileptic cases, recurrence followed each of my two operations, but I am confident that early operation would have prevented it in this case. A partial excision of the humeral head is probably the only operation which will now prevent it. In another epileptic, the reshaping of a deficient glenoid cup was necessary for a cure. In three other epileptics there have been no recurrences since operation, although in one there have been as many as sixty-eight epileptic attacks since operation.

The history of capsulorrhaphy is largely one of changing technique. Perthes varied the method of exposing the capsule in each of his four cases, and his experience illustrates in an interesting manner the difficulty of exposing the shoulder capsule for a plastic operation on it. In his first case he carried the incision from the coracoid process along the anterior margin of the deltoid nearly to its insertion, and, after dividing it near its insertion, turned the incision upward along the posterior border of the muscle to about its middle. The large flap thus formed permitted a free exposure of the joint without injuring the circumflex nerve. In the second case an incision was made along the spine of the scapula and acromion and a 0.5 to 0.75 cm. strip of these bones was separated by the chisel, to be wired in place later. In his third case he made an incision along the anterior margin of the deltoid. Above the coracoid process the fibers of the deltoid were divided up to the clavicle. One centimeter from its tip the coracoid process was sawed through and the tip turned downward with its attached muscles. The pectoralis major was later divided for retraction inward. The particular object was to expose the anterior glenoid margin. In the fourth case he employed the usual anterior resection incision and partially divided the deltoid at its origin from the clavicle.

From a study of the cadaver I concluded to make the incision in the axilla, anterior to the large vessels and nerves. This operation was performed on twelve of the eighteen shoulders. It is still preferred to any of the operations previously done, but I do not expect to do it again unless for some special indication which I cannot now foresee. It has one disadvantage, which I sought to overcome, but without marked success after twelve operations. Exposure of the capsule is obtained only under constant,

strong traction on the edges of the wound, especially on the outer side. It was employed in two cases by Telford,[1] who regarded it as distinctly superior to other operations, and was referred to very favorably by Stimson.[2] The axillary route became much more valuable when the capsule was exposed through an incision behind the large vessels. This was suggested by the observation that the humeral head in passing to the dislocated position, did not push the axillary vessels and nerves in front of it, but came much nearer to the surface behind the vessels. The operation still remains an anatomical one, chiefly because of the position of the circumflex nerve, which, however, is more easily located and avoided than in the anterior operation. The anterior operation required from an hour to an hour and a half; the posterior can be done in from twenty minutes to a half hour. After the skin and fascia have been divided, exact attention must be paid to the anatomical route by which the capsule is to be exposed.

Posterior axillary operation. To better provide the necessary asepsis, the arm is surrounded by a sterile towel from and including the hand to the shoulder region, the towel being held in place by a sterile bandage. This will permit the necessary movement of the limb during the operation without endangering the asepsis. The arm is then placed on a small side table at a right angle or slightly more with the body. An incision four or five inches long is made posterior to the axillary vessels with its center over the humeral head, which is easily felt by deep palpation. The vessels cannot be located well by palpation, but if the incision is made where the posterior axillary fold muscles fuse with the arm it will be posterior to the vessels. When the skin and fascia have been cut, the handle of the knife will easily expose the glistening tendon of the latissimus dorsi in the bottom of the wound. Immediately above it will be found the subscapularis, which is not tendinous here. Through this muscular interspace is to be exposed the capsule which lies immediately under the subscapularis and adherent to it. This muscle, therefore, must be retracted upward and inward and can be separated from the capsule by the handle of the knife or the finger. Before this step is begun, however, the circumflex nerve and its accompanying vessels must be located. With the humeral head in the socket, they lie at the upper or humeral end of this muscular interspace. If the head is in the dislocated position, the nerve and its vessels may pass over the most prominent portion of the head, so that one may come down on them unexpectedly. I have done this several times without special risk to the nerve, but I prefer to have the head in the socket and know from the beginning more exactly where it is to be found. About two and a half inches below the circumflex, the dorsalis scapulæ branches of the subscapular vessels pass backward through this interspace. The latter may be divided between ligatures to permit a freer retraction upward of the subscapularis, but *not before the circumflex nerve and vessels have been identified.* I have not divided the dorsalis scapulæ vessels, except in one case in which one of the veins was opened. The retractor pushed them aside sufficiently to permit the upward retraction of the subscapularis. The exposure of the capsule obtained was not a free one, but was quite sufficient for the necessary work on it.

In three out of the seven cases in which this operation was done, not even a catgut ligature was necessary and there was very little oozing. In another case only two ligatures were applied. After locating by palpation the anterior glenoid margin and humeral head through the capsule, the latter is incised from the upper to the lower limits of the joint about midway between the glenoid and humeral attachments. The upper part cannot be seen, but is easily and safely cut by the knife or scissors under the guidance of the finger. The joint is then explored by the finger. A small piece of bone may be detected in the antero-inferior part of the joint, loosely attached by a fibrous pedicle or embedded in the capsule. In the latter case, it may be allowed to remain. I have never known a patient to complain of symptoms indicating a loose body in the shoulder joint in any of these cases. They are detached fragments of the anterior glenoid margin produced in the original dislocation; i.e., they are tear fractures. If sought for, there will be found, probably always, a more or less shallow groove in the postero-superior portion of the humeral head where it presses against the anterior glenoid margin in the dislocated position. A very deep groove of this kind was probably responsible for the failure of my two operations in one case to prevent recurrences. In most cases the defect is too shallow to have any influence on the result of capsulorrhaphy. With the head in the socket the margins of the capsule wound are overlapped.

The only case in which I have had operative trouble was one in which necrosis resulted from a capsule suture under too much tension. I have

[1] Lancet, Lond., 1912, August 3.
[2] Fractures and Dislocations, 1912 edit., p. 668.

guarded against this ever since. Soon afterward plain catgut was substituted for chromicized, then the number of capsule sutures was reduced, and in the last four cases no suture was left in, in two of these neither suture nor ligature being left in the wound. In two cases a long silk mattress suture was so introduced that the lower margin of the capsule incision was drawn upward under the upper margin, the suture being clamped near the capsule by a long forceps which answered temporarily for a knot.

In a more recent operation three such sutures were employed for more accurate overlapping. Interrupted catgut sutures were then passed through the skin margins of the wound but not tied. A small rubber drainage tube was passed upward under the subscapularis to the capsule. The joint being opened widely and the wound not being compressible by a bandage, an accumulation of fluid tends to form in the wound if a tube is not employed. I have never had occasion to regret using it, but on two occasions have regretted not using it. The introduction of a grooved director evacuated the accumulated fluid, and a small tube, used for a short time, prevented a reaccumulation. The tube is usually removed on the day following operation. When the skin sutures are in, the arm is brought nearer to the side of the body and the skin sutures tied. The arm is then brought as near to the side as is compatible with the removal of the forceps clamping the silk suture. When the forceps is unlocked, it is first pushed upward to tighten the suture, which is then easily withdrawn by pulling on one end. The overlapping of the capsule margins is thus maintained and cannot be disturbed afterward because the arm will not leave the side until after cicatricial union is complete. A number of layers of gauze are placed high in the axilla to cover the wound and the arm bandaged in the Velpeau position.

When the bandages are removed on the following day the dressing will be saturated with joint and wound secretions. The tube can then be removed and the dressings reapplied as before. Usually they need not be changed again for ten days or two weeks, when they are entirely removed and the patient allowed to pass the arm into the sleeves of his coat and shirt. He cannot now abduct the arm far enough, voluntarily, to produce a dislocation. An epileptic would require immobilization for about four weeks, because of the danger of an epileptic attack before this time. At the end of the third week a non-epileptic patient should begin to force the arm upward anteriorly. At the end of the fourth week I permit him to use as much force as he can, actively, and at the end of the fifth week as much as he can, passively, in forcing the arm upward. This is the only movement I insist upon, and it is easily carried out by the patient by climbing a hanging rope, hanging from a horizontal bar, or creeping up the side wall with his hand, marking his progress from day to day. When he can raise the hand on the affected side as high as on the other, all movements of the shoulder-joint will be about normal. After the posterior axillary operation, return of normal movement is much more rapid and less troublesome than after the anterior operation, because the large vessels and nerves are not involved in the cicatrix and only the shortened capsule requires stretching.

The advantages of the anterior axillary operation over others previously employed have been discussed elsewhere.[1] Briefly they are as follows: The incision is only five or six inches long; it leads directly to the portion of capsule to be shortened, gives perfectly dependent drainage and divides only one muscle, the subscapularis, half-way across. The advantages of the posterior axillary operation over the anterior may be summarized as follows: (1) The wound is smaller. (2) The large axillary vessels and nerves are not exposed, and the circumflex nerve and its vessels are more easily exposed, identified and safeguarded. (3) The anterior circumflex vessels are always divided in the anterior operation, never in the posterior. (4) Access to the capsule is much easier and more rapid. (5) No muscles are divided. (6) There is practically no hæmorrhage; in the anterior operation there was always considerable oozing. (7) The time of operation is only about a third of that necessary for the anterior. (8) Return of normal motion is much more rapidly and easily obtained. (9) The elimination of buried material, as ligatures and sutures, and the small direct wound to the capsule in the dependent position, reduce the risk of operation to a minimum. If it were not for the position of the circumflex nerve and the opening of the joint, the operation on the early, uncomplicated case might properly be placed with the minor operations.

All the cases operated on are included here, the four already reported to show how they have progressed since. Details are sacrificed for brevity, except where they concern phases of the condition and operation not previously brought forward. The patients have all been heard from very recently.

[1] Am. J. M. Sc., 1909, March 12, 834.

CASE 1. Athlete, 23 years old at time of operation. First dislocation in a football game in 1904. Wore shoulder brace for several years, but dislocations recurred while wearing it. Operated on Jan. 18, 1908. Obtained practically full motion in eight to ten weeks, and later absolutely full motion. Has never had a dislocation since, although he has used the arm violently in many ways, as in gymnasium work and semi-professional boxing.

CASE 2. Coal miner, 42 years old at time of operation. First dislocation 25 to 30 years before. Recurrences finally became so frequent that at times they would occur every day, sometimes two and three times a day, and sometimes while asleep in bed. Had to give up all work because he feared to take the arm from his side. Operated on Jan. 30, 1909. Thirteen weeks later he fell headlong from a balcony over a railing which was 17 feet from the ground. He evidently struck on his hands with the arms in abduction, a position particularly likely to produce the dislocation. He had a long wound of the scalp and a probable fracture of the skull which confined him to bed for nine weeks and left him with disturbed mentality for months afterward. He still complains of intracranial troubles. He later returned to his work in the coal mines, has never had a dislocation since the operation, and believes that this arm is the strongest part of his body now.

CASE 3. Hospital orderly, 26 years old at time of operation. First dislocation in May, 1904. Was operated on July 2, 1906, for the purpose of shortening the capsule. The dislocations recurred after this operation. March 26, 1909, he was again operated on, but recurrence again followed the operation. I did the third operation June 6, 1909. He has had no dislocations since, but he has had other troubles. These began with a strangulation necrosis of the capsule resulting from a chromicized mattress suture applied under too much tension and grasping too much tissue, because of my anxiety to prevent further dislocations. The discharging sinus healed completely soon after the appearance in the dressing of the almost intact catgut suture. The return of motion was much slower in this than in any of the preceding cases, abduction being limited to about 140 degrees at the end of about a year and a half. At this time he had been training a young professional boxer for months, and the exercises had become very vigorous and even violent, the patient being able to strike almost, if not quite, as hard a blow with the affected as with the unaffected arm. One day in boxing he had severe pain in the affected shoulder, but continued the boxing. He did not report to me for a month later. During this time, and for a month after reporting to me, he continued to work as a railroad brakeman. He localized the pain on movement to the posterior part of the shoulder. I concluded that he had ruptured a few fibers of the deltoid and that they would ultimately heal without much trouble. About a month later he returned showing a small lump in the region of the chief pain, about the size of a cherry. This was incised and a small quantity of pus evacuated. The sinus persisted and limitation of movement indicated that the joint was involved, although the pain and swelling usual to this condition were not present. There was little change by June, 1912, except that the stiffness of the joint was more marked. By this time I had concluded that during boxing, in a violent abduction or external rotation movement, the overlapped and now very strong capsule sustained the force, and, instead of giving way itself, had torn away a fragment of the anterior glenoid margin. On opening the joint June 6, 1912, an irregular projection of this portion of the cup was found, and a probe passed into the joint through the sinus appeared in the joint just below this glenoid projection. The anterior operative wound was closed and the sinus enlarged for better drainage. Many times the sinus closed only to open again. Finally on May 27, 1913, the head of the humerus was excised. The wound closed in seven weeks. The movement of the new shoulder-joint, while slight, is increasing continually, the power of the whole limb is returning very favorably, and the patient has a very useful arm from the excision. He was formerly a semi-professional baseball player, and since the operation has played through several baseball games with considerable success, the movement of the scapula providing a fair range of movement of the arm.

If I had seen the patient immediately after the first occurrence of the pain in boxing and had then interpreted properly the cause of it, immobilization of the arm at the side would have brought the fragments accurately together. In five or six weeks good union would undoubtedly have taken place and in a short time the motion of the joint would have been about as free as before the accident. The patient's failure at first, and mine later, to appreciate the gravity of the condition, led to necrosis and suppuration with sinus formation, and finally to excision of the joint. But excision was the operation of choice before capsulorrhaphy was introduced. The necessity for excision in this case was due primarily to a capsule suture, and this fact has led me to abandon the capsule sutures entirely, so that such a complication cannot occur again.

CASE 4. Man, 21 years old at time of operation. First dislocation 5 years before from a fall in an epileptic attack. Has had twelve dislocations, most of them in epileptic attacks. First operation Oct. 16, 1909. About ten weeks after operation, when he had practically full motion in the shoulder, the patient reported that after an epileptic attack his shoulder, which had been operated on, would be painful. Soon afterward he reported that the dislocation had recurred, but that the head was not as far out as before the operation. Later they were as complete as before operation. Second operation, Nov. 15, 1911, at University Hospital, before members of Surgical Congress. Incision posterior to axillary vessels, with humeral head in dislocated position. Circumflex nerve found crossing most prominent portion of head. Several small vessels divided —probably branches of dorsalis scapulæ. Capsule found to be about half an inch thick from previous overlapping. Edges of incision in capsule again overlapped by catgut sutures; small gauze drain to arrest venous hæmorrhage; dressing and Velpeau bandage. Drain removed in 48 hours. Skin sutures removed and patient left hospital 4 days after operation. Velpeau position maintained four weeks. Could then abduct arm only to 45 degrees and external rotation was very slight. Continued to bind the arm to the side at night. Seven weeks after this operation he had a dislocation while in bed with the arm bound to the side. Has been having them ever since and they are now more frequent than before the first operation.

The defect in the posterior and upper portion of the humeral head was unusually deep and wide at time of first operation and it had grown larger at time of the second operation. The epileptic convulsions in this case are unusually strong and with the large defect in the head made a condition which capsulorrhaphy probably will not cure. Only excision or arthrodesis will prevent the recurrences now.

My conception of the part played by the defect in such a case as this is as follows: In the normal shoulder, bony contact is maintained at all times between the head and glenoid cavity, even in the extremes of normal movement. In extreme

abduction the axillary portion of the capsule must first tear extensively, the outer surface of the surgical neck must strike the edge of the acromion and the head must be pried out of the socket, before a dislocation can occur. In such a case as this one, the resistance of bony contact between the head and glenoid is lost as soon as abduction has been carried far enough to bring the deficient portion of the head opposite the anterior glenoid margin. The only resistance which then prevents an anterior dislocation is that of the anterior portion of the capsule, which gradually yields to the powerful contractions of the axillary fold muscles in the successive epileptic attacks. As soon as the groove in the head fits accurately to the anterior glenoid margin, the pressure of which in the dislocated position produced the groove, the head will be in the fully dislocated position. When the groove in the head is very small and the patient is not an epileptic, the cure seems to be permanent and the shoulder very strong. Even in most epileptics, as my cases show, the dislocations do not recur after capsulorrhaphy. The lesson which this case teaches is that capsulorrhaphy may be delayed so long, particularly in an epileptic, that this operation may not suffice for a cure.

Case 5. Medical student, 20 years old; athlete. Referred by Prof. R. Tait McKenzie. Right shoulder dislocated in September, 1908, while playing football. Arm not bound to side after reduction and patient played football again same day. Second dislocation about a month later from throwing a stone. Has had about eight dislocations all together, some while asleep in bed. Can fully abduct arm without producing dislocation, but avoids this movement as much as possible. At first he gave up all athletics except swimming, and after having three dislocations in six attempts at swimming gave up this exercise also. Operation Nov. 23, 1909, in University Hospital on service of Prof. J. William White. Incision anterior to axillary vessels. Loose piece of bone attached by fibrous band found in lower part of joint, and a corresponding defect in anterior glenoid margin. It was clearly a detached fragment of the glenoid and was about ¾ in. long and ¼ in. wide and thick. Operation completed as usual. Small drainage tube removed on following day and patient allowed out of bed. Skin sutures removed and patient left hospital 5 days after operation. Prof. McKenzie took charge of exercises to restore motion, which was normal in four weeks. About six weeks after operation, was thrown from a sled while coasting and went down an enbankment, without injury to the shoulder. During following summer played tennis and swam a good deal. On one occasion a heavy boat, which he was using in swimming, turned over in shallow water. While trying to turn it right side up, he had almost succeeded, when it turned backward again. He attempted to prevent this backward turn with the arm operated on, which required a very strong effort on his part and resulted in a violent wrenching of the shoulder in abduction and external rotation. There was momentarily the sensation of the head jumping out of the socket. On his return to college that fall he began to play football. On one occasion he fell headlong with the affected arm in extreme abduction. He again experienced the same sensation as when trying to prevent the boat from turning backward. He has had no trouble in this shoulder since, although he has played tennis and baseball, and has done much swimming.

Case 6. Man, 39 years old, chronic alcoholic and epileptic. Recurrent dislocation in both shoulders. Has been having epileptic attacks for 10 years. Had his first dislocation in left shoulder in an epileptic attack about two years ago. Arm bound to side after reduction by a physician, but patient removed bandage on following day and did not have it replaced afterward. Does not know how many dislocations he has had in this shoulder, but they recur, sometimes as frequently as four and five times a day. He can produce it voluntarily with the arm at the side of the body, which is very unusual, but the head tends to jump back into socket on slight muscular effort. About eight months after the left shoulder was first dislocated, the right was dislocated in an epileptic attack and recurrences have been taking place in this shoulder at variable periods since. He did not bind the arm to the side after the first nor any of the succeeding dislocations. He says that he can produce the dislocation in this shoulder voluntarily, but it gives so much pain that he does not care to do so.

Operation on right shoulder at University Hospital in service of Prof. J. William White, Dec. 11, 1909; operation on left shoulder Jan. 8, 1910, both through anterior axillary incisions. On passing finger into and examining this joint (left), it was found that the anterior half of the glenoid cavity was missing. Its posterior intact portion was represented by a strip of cartilage-covered cup, about half an inch wide, extending from the attachment of the long head of the biceps above to that of the long head of the triceps below, both of which attachments were intact. The whole anterior portion of the glenoid process had been worn away by the frequently repeated recurrences (often five or six a day), in the dislocated position the posterior portion of the head pressing strongly against the anterior glenoid margin. The effect of this condition on the glenoid was to produce a sloping surface from the posterior glenoid margin forward and inward into an abnormal pocket which received the head in the dislocated position. It seemed surprising that the head could stay in its normal position at all, yet it required considerable muscular effort on the part of the patient to dislocate it and only a little effort was necessary to cause it to jump back into the socket, where it would remain until forced out again. I had not expected to find this condition and had not received permission from the patient to do more than contract the capsule as in the right shoulder, and this was all that was done at this time. Primary healing; drainage tube removed on following day; arm kept bound to side of body for 25 days. On April 22d had almost full motion in right arm and could raise left arm above his head. Feels a "crack" in left shoulder from time to time, but has not had a dislocation in either shoulder since the operations.

The patient spends most of his time in institutions because of his alcoholism and epilepsy, so that I lost sight of him for a long time. In September, 1910, I looked him up to find how he had been getting along. He reported only two dislocations in the left shoulder and none in the right. He probably had had more in the left. In the following spring he came to me asking for another operation on the left shoulder and giving me permission to do what I thought necessary to prevent the dislocations. I operated on him in the Philadelphia Hospital, in the service of Dr. A. C. Wood, April 10, 1911. This operation consisted in chiseling away the posterior portion of the glenoid cavity through a posterior incision

until there remained a new cup with a slightly raised anterior margin (Hildebrand), and through an axillary incision cutting the capsule, freshening the sloping bony surface by a curette and packing the wound with gauze so as to cause the abnormal anterior pocket to become filled by cicatricial tissues and adhesion of the capsule. The posterior wound was closed completely and the anterior wound around the gauze packing. Dressing and Velpeau bandage; drain removed on third day; wound completely closed in three weeks. Has never had a dislocation in either shoulder since. There is still slight limitation of movement in the right shoulder and very little more in the left. If he had had ordinarily good habits, mentality and ambition, he could now have perfect motion in the right and practically perfect in the left shoulder.

CASE 7. Student and athlete, 19 years old. Referred by Prof. R. Tait McKenzie. Left shoulder first dislocated in November, 1907, in a football game. Arm not bound to side afterwards. Second dislocation in February, 1908, in a basket ball game. Chloroform necessary for reduction. Third dislocation two weeks later in a basket ball game and chloroform again necessary for reduction. Then gave up all athletics and did not have another dislocation until January, 1909, when it resulted from throwing a valise upon his shoulder. Reduced under chloroform anæsthesia. Operation Dec. 29, 1909, in University Hospital, in service of Prof. J. William White. Incision anterior to axillary vessels. Large nerve, evidently circumflex, seen passing over lower margin of subscapularis and disappearing through fibers of this muscle above. It was seen that the humeral head came through the subscapularis in each dislocation and that a considerable portion of the muscle had disappeared on this account. After dividing and lifting the remains of the muscle from the capsule, this was overlapped as usual by catgut sutures, the deficiency in the muscle being only partly closed. Patient left hospital in 5 days, and under Prof. McKenzie's charge obtained practically full motion in three weeks.

The after-course of this case has such an important bearing on what the shoulder can stand after operation that it will be briefly outlined: The patient began training for the crew of his university in February, 1910, but gave it up soon after the crew took to the river, from lack of confidence in the shoulder operated on. I then lost sight of him, until March 3, 1912. In the meantime he had gradually tested the shoulder to find what it would tolerate. During the summer of 1910, he played tennis, swam, and did other work of the same character. During the following winter he boxed a good deal. In October, 1911, on returning to college, he began wrestling in the gymnasium and soon decided to try for a place on the university team in the 158-lb. class. This required wrestling for practice from a half-hour to an hour each evening. In January, 1912, he was induced to enter the 175-lb. class. He weighed 165 lbs. and could increase his weight for the one class or reduce it for the other. In practice he would sometimes wrestle with men of 200 lbs. weight. Each contest with another institution was preceded by elimination trials to decide who should represent his university. The patient was the representative in his class in the contests with Columbia, Cornell, Lehigh and Princeton (on two occasions). He won his bouts in all except that with Lehigh, which was a draw, and in the second contest with Princeton, March 3, 1912, in which he sustained a mild upward dislocation of the outer end of the clavicle on the left side which corresponded to the shoulder operated on. At the time he thought that this shoulder joint had given way.

In October, 1912, he began wrestling again. In view of what the shoulder had stood without my knowledge, I did not interfere with his ambition to continue. He practiced at least three times a week, and, as the elimination trials approached, his wrestling became more frequent and violent. On the evening of November 25th, he had been engaged chiefly in practicing the release from the "three quarter Nelson" hold, which he would permit his opponent, a good wrestler weighing 165 lbs., to take beforehand. To release himself it was necessary to work himself into such a position that he could stand on his head and while in this position quickly spin his whole body around, at least twice, when he would have unloosened the hold of his opponent. This exercise had been practiced many times previously, and on this evening he had released himself five times successively. On the sixth trial he had completed the manœuvre and was free, but was on his hands and knees with the left arm at about a right angle with the body and his forehead touching the floor, when his apponent fell on this, the left shoulder. An anterior dislocation resulted and was reduced under nitrous oxide anæsthesia. The patient explains that in wrestling, he "works" with his left arm, which exposes the left shoulder to much the greater violence and twisting. This accounts for the dislocation of the left clavicle on March 3, 1912, and of the left shoulder on November 25th. That this was not an ordinary recurrence of a recurrent dislocation, in which the head jumps easily into a hernial sac waiting to receive it, was shown by the violence necessary to produce it. After such a recurrence, nothing is torn and in a few days the function is as good as before the recurrence. After the reduction of this dislocation, the shoulder was swollen and very painful; the arm was bound to the side for four weeks, and a month later no force had been used to overcome the limitation of movement in the shoulder, which was now very marked and resistant. On May 5, 1913, the shoulder motion was almost normal, and at the present time is normal, and there has been no further trouble in the joint. I believe that the dislocation was a new traumatic one, such as occurs from forced abduction in a previously normal joint; i.e., a new tear of the capsule was necessary, that this tear healed firmly and that the patient has now as strong a shoulder as one may expect after the ordinary traumatic dislocation of the shoulder.

CASE 8. Woman, 32 years old, epileptic for 11 years, referred by Dr. J. Hemphill, of West Chester, Pa. Had her first dislocation in an epileptic attack, 8 years before operation. Reduced on following day, but arm not bound to side afterward. At first the dislocations occurred only during epileptic attacks, but later, on the least exertion. It was easily reduced each time by some bystander. Operation at West Chester Hospital, January 19, 1911. The dislocation had remained unreduced since the last recurrence several months before, but was easily reduced at the time of operation, after a few manipulations to break up the limitation of movement, by traction on the arm held at right angles with the body. The usual operation was done through an anterior axillary incision. The hospital interne, Dr. Dorwarth, reported that the drainage tube was removed on the following day, that healing was by first intention, and that the patient left the hospital January 29th in splendid condition. Dr. Hemphill reported very recently that the patient has full motion and power of the limb operated on, and that she has never had a dislocation since the operation.

The following case was operated on by Dr. A. C. Wood. A brief report of it is included here, with his permission, in order, especially, to place on record another case in which the axillary opera-

tion was done, as well as to show the result of the operation.

CASE 9. Farmer, 21 years old at time of operation; now a medical student. In May, 1909, fell from a carriage to the ground, dislocating his left shoulder. Arm not bound to side after reduction, but was kept quiet at the side for about a week. Second dislocation several months later while climbing a tree. Recurs about once a month; at times, several times in one week. Generally succeeds in reducing dislocation himself. Operation at University Hospital, February 17, 1911. Incision anterior to axillary vessels, and capsule overlapped by catgut sutures. Small drainage tube employed, which was removed on following day. Primary healing. In a few months was able to do his usual work, has never had a dislocation since the operation, and has practically full motion in the shoulder and power in the affected limb.

CASE 10. Man, 24 years old; athlete. About 5 years before operation, dislocated right shoulder in a basket ball game. Reduced immediately by a fellow-player who pulled on the arm held in abduction. Patient continued to play and had second dislocation during same evening. Arm not bound to side after reduction, but he continued to use it afterward. Cannot recall time of next dislocation, but has had five or six in all, the last one on Christmas Eve, 1910. Did not work for five weeks after this because of the pain and disability. Shortly after the first dislocation of the right shoulder, he dislocated the left one in a basket ball game. This shoulder has been dislocated twice, at least,— how much oftener he cannot say, but he has not dislocated it for three or four years. Operation on right shoulder at University Hospital on service of Professor Edward Martin, Sept. 9, 1911. Usual operation through incision anterior to axillary vessels. Distinct groove found on posterior part of head at usual site. Small rubber-dam drain. On third day temperature rose to 101⅘°. Drain removed, grooved director introduced, and a considerable quantity of dark liquid blood evacuated. Drainage wound closed in two weeks and patient sent home to Scranton, Pa., a week later. Had practically full motion in eight weeks. Has continued his athletic work since, engaging particularly in gymnasium work, basket ball and baseball, but has not had further trouble in the shoulder operated on.

In January, 1913, while working in the gymnasium, he dislocated his left shoulder again, and since that time it has been out four or five times. Recently it was dislocated twice in the same evening, about fifteen minutes apart. He then decided that he would have this shoulder operated on also. This was done at the University Hospital, July 31, 1913, on the service of Professor Edward Martin, through a posterior axillary incision. The only points of interest in connection with the operation are as follows: The circumflex nerve was not found close to the humerus but lower in the middle of the field of operation so that it had to be guarded against more carefully than usual, and the lower fibers of the subscapularis were torn considerably by the strong retraction on it. Three silk mattress sutures were used in this case. The patient left the hospital at the end of one week, the city at the end of the second week, but kept the arm bandaged in the Velpeau position until the end of the third week.

CASE 11. Woman, 24 years old, epileptic since 15 years of age, referred by Dr. J. W. McConnell. Has had only two dislocations, the first March 16, and second, June 20, 1912, both during epileptic attacks and both while in bed. Operation July 15th, at University Hospital, in service of Professor Edward Martin. Incision posterior to axillary vessels. Finger in joint detected a shallow groove in head at usual site. Capsule overlapped by plain catgut sutures and operation completed in usual manner. Tube removed in 48 hours, skin sutures in five days, and patient left hospital at end of a week. All bandages removed at end of three weeks, but seventeen days after operation patient had two severe epileptic attacks on same day, and three months after operation fell headlong down a flight of stairs. Has almost full motion and had had 68 epileptic attacks (up to July 16, 1913) since operation, but has not had a dislocation.

CASE 12. Man 21 years old epileptic, referred by Dr. J. H. Swaving of Pottsville, Pa. Ten years ago suffered from fracture of skull and eight years ago began to have epileptic convulsions. First dislocation of left shoulder about two years ago in an epileptic attack. Seems to have most of his attacks at night, and he thinks the dislocations have recurred at least two or three hundred times, a dislocation occurring with every convulsion. Recently it has been taking place whenever he lies on the left side, or abducts the arm suddenly. Says that two days before admission he had a series of convulsions and from that time to the day of admission, the dislocation has recurred about fifteen times. He is somewhat dull mentally and his statements may be unreliable, but he insists that they are true. I have obtained experimentally on the cadaver, on both sides of the same body, a condition almost exactly identical with that found in this patient's shoulder at operation. In both shoulders of the cadaver the dislocation could easily be reproduced on abducting the arm but could not be maintained on bringing the arm to the side of the body. Operation in University Hospital, in service of Prof. Edward Martin, July 16, 1912. Incision posterior to axillary vessels. Finger in the joint recognized a large movable fragment, representing almost the anterior half of the glenoid process. It is evident that in the first dislocation the anterior and lower part of the capsule had remained intact and had pulled away this fragment. In each dislocation the humeral head passed forward and downward between the two portions of the glenoid process, pushing the movable fragment away from its fellow. The head could not become locked in the dislocated position when the arm came to the side, as it does in the usual dislocation when the head passes over the anterior margin of the intact cup. There was a fairly large defect in the head at the usual site. After thoroughly curetting the adjacent surfaces of the two fragments of the glenoid process, I concluded to do the same with the surface of the groove in the humeral head. This was accomplished through an incision posterior to the deltoid, the tendon of the teres minor and the capsule being divided to gain access to the joint posteriorly. In addition to curetting the surface of the defect in the head, I also chiseled away the posterior margin of the glenoid cup, in order, if possible, to cause the head to rest more posteriorly on the cup. The posterior wound was closed without drainage, a dressing applied to the wound and the patient again placed on his back. Through the axillary wound the movable fragment was forced against its fellow as closely as possible and the capsule opening closed by gauze packing. Dressings were applied to both wounds and the arm bandaged in the Velpeau position. The gauze packing was removed in three days and was not reintroduced afterwards, the wound merely being covered by the gauze dressing. Skin sutures removed in seven days; wound closed in about three weeks, but the arm was immobilized in the Velpeau position for six weeks. My object was to obtain bony or firm fibrous union between the two fragments of the glenoid process and thus to reform the glenoid process, and to fill the defect in the head with granulation tissue and adhesions to the corresponding portion of the capsule. As was to be

expected, limitation of movement was severe when the dressings were removed. He was discharged July 28, 1912, and later readmitted to the institution for feebleminded in Spring City, Pa. The physician in charge, Dr. H. M. Carey, reported that there had been no dislocations since his readmission, that the patient had a fair range of movement of the arm, but that he died March 30, 1913, from the effects of epilepsy.

CASE 13. Man, 31 years old, strong and vigorous, referred by Dr. C. E. Murrin, of Scranton, Pa. First dislocated his right shoulder 5 years before operation. Reduced by a physician and arm bound to side for three or four days, after which he used it as freely as the pain would permit. Does not know how many dislocations he has had. Had the last one about three weeks before operation, and another two weeks before that. From the beginning, pain has been severe for a few days after each dislocation and reduction. Operation at the West Side Hospital, Scranton, Pa., Sept. 24, 1912, Drs. Norman White and C. E. Murrin assisting. Usual operation through posterior axillary incision. No ligatures used; capsule overlapped by one No. 1 plain catgut suture. Shallow groove in posterior part of head at usual site; small rubber tube drain; catgut sutures for skin; Velpeau position. Tube removed in 24 hours. Left hospital in 4 days. Dr. Murrin reported (Oct. 29, 1912) that patient had almost full abduction, and Dec. 3, 1912, when I next saw him, he had full motion and excellent use of arm.

May 1, 1913, while driving a light wagon, his horse stumbled and fell. In hurriedly jumping from the wagon he had grasped the dashboard with his right hand and had one foot on the side step when the horse got up and toppled over again. This threw the weight of his body on the right arm, turning it backward in external rotation and abduction, and when he landed on the ground his right shoulder was dislocated. He did not have the arm bound to the body after reduction of the dislocation. Although he had been having recurrences every few weeks before operation, he has not had any more since May 1st, to date, August 20th, nearly four months. If he had reported the accident to me immediately, I would have had the arm bound to the side in the Velpeau position for at least three weeks. I believe that there must have been considerable laceration of the axillary portion of the capsule and that with three weeks' immobilization of the arm in abduction and internal rotation the important axillary portion of the capsule would have been cicatricially shortened again — perhaps more shortened than by the operation. This might have made the shoulder as strong or even stronger than before this last dislocation. He reports that it feels just as good as before this dislocation, that he uses it freely and that it seems perfect in every way, that he has "played baseball, lifted 50 and 75-lb. chests of tea, 100 and 125-lb. bags of coffee," and has been doing "pushing and lifting and heavy work around wagon."

CASE 14. Man, 26 years old, referred by Dr. J. J. Rutberg. First dislocation from falling downstairs with arm in hyperabduction. After reduction, arm bound to side for about 10 days or two weeks. In August, 1912, had his second dislocation, while trying to hold another person down on a couch, when the arm was forced into abduction. Had third dislocation Dec. 18, 1912, while in a trolley car which gave a lurch, wrenching the shoulder while he was grasping a handrail. The arm was still bound to the side when I first saw him Jan. 5, 1913. Operation at Stetson Hospital Jan. 8, 1913. Incision posterior to axillary vessels. Finger in joint recognized a shallow groove in head at usual site. Capsule overlapped by two long forceps, one grasping each margin of the capsule incision. Skin wound closed by No. 1 plain catgut sutures. No ligatures used in this case. When arm was brought close to side forceps employed to maintain overlapping of capsule margins removed. Small rubber tube for drainage; dressing; Velpeau bandage; tube removed in 24 hours. Patient left hospital at end of a week, when Velpeau bandage was removed and arm bound to side, the wrist being supported from the neck by a sling. All bandages removed at end of second week. Now has full motion and has had no dislocations since the operation.

CASE 15. Man, 21 years old, athlete, referred by Dr. F. P. Phillips of Clarion, Pa. First dislocation in a basket-ball game in the latter part of 1908. Arm not bound to side, but shoulder remained painful for a few weeks. Does not know how many dislocations he has had, but during past year they have recurred from slight provocation, as when he is in bed with his arm in abduction. Operation at Stetson Hospital, Jan. 29, 1913. Incision posterior to axillary vessels. Two ligatures were employed for a divided vein in the lower part of the wound, and there was some oozing that could not be controlled by forceps and ligatures because of its depth. Finger in joint found a shallow groove in head at usual site. Overlapping of capsule margins again accomplished by long forceps. No. 1 plain catgut sutures for skin wound; gauze drain for oozing; dressing; Velpeau bandage. Gauze drain removed on following day. Left hospital 6 days after operation, but remained in the city for another week, when all bandages were removed. Did not begin to force arm upward until beginning of fifth week. Two months after operation he wrote that he had "almost perfect action of the shoulder." More recently he wrote that he had been playing baseball and using the arm as vigorously in other ways, without disturbance of the shoulder, except an occasional pain.

CASE 16. Man, 52 years old, carpenter and ship steward. Had his first dislocation in 1891, while wrestling. A fellow-workman reduced it. Did not bind arm to side. Ever since has had marked limitation of abduction and external rotation. Cannot abduct much beyond a right angle. The arm gradually grew weaker with successive dislocations, which are very irregular as to the intervals between them, but they have grown in frequency and ease of production. They have occurred while he was asleep in bed. He can earn more money and prefers to work as a ship steward, but he gave this work up seven or eight years ago because of the absence of a physician on the ship and the risk involved in a rough sea. Operation at Philadelphia Hospital April 15, 1913, in service of Dr. A. C. Wood. Incision, three inches long, posterior to axillary vessels. Small groove in head of humerus at usual site. Edges of capsule incision overlapped by long silk suture which was later withdrawn. No ligatures employed; catgut for skin; small tube for drainage; dressing; Velpeau bandage; tube removed in 48 hours. Primary healing. All dressings removed April 28th, and arm placed in sleeves of shirt and coat. Remained in hospital until he could go to work. Discharged May 16. 1913. Said that he then had better motion and use and more power in arm than before operation and that the condition was improving continually. July 10, 1913, patient asked for and received my permission to go to sea again. He has had no dislocations since the operation.

CONCLUSIONS

The operation of capsulorrhaphy cures in the great majority of cases. As performed in my last five cases, it involves very little operative trauma, primary union is obtained, and the patient may leave the hospital within a week.

Several of the patients returned to their usual occupations at the end of three weeks, and two students returned to their classes in one week.

Of the eighteen shoulders operated on, there were five in which the dislocation occurred after the operation. In one of them (Case 4), the large defect in the humeral head and the powerful epileptic convulsions made the case incurable by capsulorrhaphy. Early operation, when the defect was slight or absent, would have been effective, as shown by the successful results in three of the other five shoulders in epileptics. In Case 6, an epileptic, it was obvious at operation that the large defect in the glenoid cavity of the left shoulder would render capsulorrhaphy ineffective, although it reduced the frequency of the recurrences very much. As was proved by the second operation on this shoulder, capsulorrhaphy is sufficient for a cure of this condition, if the cup is reshaped. Early capsulorrhaphy, alone, would have been sufficient. The dislocation after operation in Case 7, in my opinion, was a new traumatic dislocation, such as that to which the normal shoulder is exposed. The two attempts of the humeral head to leave the socket, in Case 5, indicated that the capsule had not been sufficiently tightened by the operation, but the frequency with which he has exposed this shoulder to the violence of tennis and baseball playing, without a recurrence in nearly four years, indicates that the cure is permanent except for severe violence. This statement will probably hold true for Case 13 also. Of the 18 operations, therefore, it may be said that 16 were successful, one partically successful (Case 3), and one a failure, but even in this case the patient is no worse than he would have been without the operation.

The condition present in a recurrent dislocation is essentially that of a hernia of the joint, and the operation of capsulorrhaphy consists in the removal of the sac. It has one great advantage over operation for inguinal or other hernia. When recurrence after operation takes place in the latter, a cure cannot be expected without another operation. While in Cases 5 and 13 the operative shortening was probably not sufficient to prevent recurrence from severe violence, it was sufficient to compel some laceration of the capsule before a recurrence could take place. If in such a case, therefore, the arm is dressed in the Velpeau position for about three weeks afterwards, the cicatricial contraction of the torn and relaxed axillary portion of the capsule may make the joint as strong as it was made by the operation, or even stronger.

It is difficult to determine whether or not the shoulder can be as strong after operation as before. While I believe that it is not in these two cases, it is worthy of consideration that the right shoulder, which the patient would naturally expose to the greater violence, was involved in each case, and that severe violence was necessary to produce the dislocation in each instance. There have been no recurrences in either shoulder since, although nearly four years have passed in one case. In Case 10 the patient insists that the first or traumatic dislocation in the right shoulder, when it was normal, occurred from merely raising the arm to catch a basket-ball, which did not strike the arm, nor did he fall or sustain any other violence. If a dislocation had occurred since operation in this case, from such violence as produced it after operation in Cases 5 and 13, could we say that the shoulder was stronger or weaker than normal after operation? That a first dislocation of the shoulder can occur from slight violence is well known. I have one patient who dislocated her shoulder while sitting in a rocking chair from merely raising her arms in the act of "stretching."

Few normal shoulders are exposed to as much violence as was the one operated on in Case 7. That this one gave way after operation is to be explained by the fact that he did most of his work in wrestling with that arm and shoulder. The condition which developed in Case 3 is chargeable to the operation as then performed, but the cause responsible for it cannot develop from the operation as now performed.

In an epileptic, capsulorrhaphy is indicated after the first recurrence. It was performed at this stage in Case 11, and, although the patient has had as many as sixty-eight convulsions since, she has not had a recurrence of the dislocation since the operation. Spontaneous cure in an epileptic, after the first recurrence, is very improbable. It may occur in a non-epileptic, but is very rare, and the patient cannot be certain that he will not have a recurrence while he is in a dangerous position. I would advise operation in any case after the third or fourth dislocation, because I believe that the risk of operation is less than that involved in depending, for protection in danger, upon an arm the shoulder of which is easily dislocated. It is probable that every case is curable by capsulorrhaphy, when performed early, and almost every case when performed late; and that the only patients who will require a more severe operation are epileptics with large defects in the humeral head or glenoid cavity, both of which are due to repeated recurrences of the dislocation.

THE SURGICAL TREATMENT OF BACILLUS COLI COMMUNIS INFECTION COMPLICATING PREGNANCY[1]

By EDWARD P. DAVIS, M. D., Philadelphia

BACILLUS coli communis infection complicating pregnancy manifests itself most frequently by infection of the appendix and of the right kidney. The following cases are illustrative:

Case 1. Italian multipara, aged 23 years, ill-nourished, ill seventeen days, pregnant seven months; continuous pain over right abdomen, vomiting and chills; pulse from 100 to 120; temperature from 101° to 103° F.; leucocytosis 26,600; urine, acid; abundant bacillus coli communis in pure culture. The left kidney could not be palpated, but the right kidney could be distinctly outlined and was considerably enlarged.

The patient was treated by rest in bed, milk diet, hexamethylenamine, purgation and the copious use of water, which failed to produce improvement. The advent of chills suggested the development of surgical kidney and the need for operation.

The right kidney was exposed by the usual lumbar incision. It was much enlarged and dark bluish in color. Stitches of chromicized catgut were passed through the two extremities of the capsule and the kidney incised along its convex border. An abundant flow of dark blood followed. The finger of the gloved hand was passed through the kidney substance to the pelvis and the opening dilated sufficiently to permit the introduction of a gauze drain. Blood from the kidney showed bacillus coli communis in abundance. The lumbar wound was closed at its extremities, leaving the center open for drainage.

An enlarged appendix was then exposed by the usual incision, and removed. It was in a condition of chronic inflammation. The patient immediately improved, and three weeks after operation came into spontaneous labor, giving birth to an infant 46 cm. long, and weighing 6 lbs. 8 oz. Both mother and child made an uninterrupted recovery.

Case 2. Patient aged 21 years, second pregnancy at five months; sent to the Maternity Department of the Jefferson Hospital from the examining room of the General Hospital, having been sent by a physician with a diagnosis of typhoid fever. The patient had characteristic symptoms of toxæmia with fever and intestinal disturbance.

On examination the red blood cells were 4,500,000; leucocytes, 20,000; hæmoglobin, 75 per cent. An acid urine contained bacillus coli communis in pure culture in abundance. No definite history of the duration of the patient's illness could be obtained, as she had been under treatment for typhoid fever for some time before admission. Neither kidney could be made out by palpation and the patient could give little information concerning her condition.

The right kidney was drained by the method employed in Case 1. The bacillus coli communis was found in abundance in the blood discharged from the kidney. The appendix was post-cæcal and was removed without difficulty. The patient's recovery was uninterrupted, and her pregnancy was undisturbed. She was discharged in good condition, as she preferred to be at home for her confinement.

Medicinal treatment in this case, prior to operation, was unavailing, and the patient's toxæmia and fever were steadily increasing when the decision to operate was made.

Case 3. A very ill-nourished Italian multipara, aged 38 years, was admitted to the Maternity Department of the Jefferson Hospital because she was pregnant and complained bitterly of severe pain in the lumbar region.

On examination the patient was emaciated, six months pregnant with a living child, profoundly toxic, and complained of severe pain in the right lumbar region. Her relaxed condition permitted the right kidney to be distinctly outlined, considerably enlarged.

Medicinal treatment failing, the appendix was first removed, inflamed and adherent. As no pus was present in the abdomen, and the appendix had not ruptured, the wound was closed without drainage. The right kidney was greatly enlarged, and an abundant flow of very dark blood followed its incision. This contained in great quantity the bacillus coli communis, and the blood was highly infectious as the edges of the wound became infected, and the wound healed by granulation in consequence. The kidney was drained by the method described.

Before operation the urine was highly acid, with abundant bacillus coli communis; the patient's leucocytosis was 25,000. She steadily improved, although the lumbar wound healed slowly, until two months after operation, when she gave spontaneous birth to an eight months' child. This was artificially cared for in the nursery of the Maternity. As the mother could not nurse the child, she went to her home to care for her other children, returning frequently to the Maternity to visit the child left in our care. The mother made an excellent recovery.

Since the publication of Opitz's (4) and Mirabeau's (3) papers, attention has been repeatedly drawn to bacillus coli communis infection of the kidney complicating pregnancy. Appendicitis in pregnancy has been so thoroughly investigated that time and space permit no separate attention to that subject.

Clinicians recognize infection of the right kidney as much more frequent than the left, and account for this in three ways: First, the ascending infection from bacillus coli invasion of the bladder and ureters; second, hæmatogenic infection from the circulation of infected blood through the kidneys; third, infection of the right kidney by the bacillus coli communis from the neighboring and often contiguous colon, the bacilli making their way through the wall of the intestine into the lymphatics by way of the ureter and surrounding tissues to the pelvis of the kidney. Clinical and experimental evidence establish these methods of infection.

[1] Read before the 17th International Congress of Medicine, London, August, 1913, Section on Obstetrics and Gynecology.

The predominant symptoms are those of toxæmia, with high leucocytosis, and acid urine containing bacillus coli communis in pure culture. The condition of the urine is significant and differentiates the infection from cystitis.

As Burnett (2) has shown, the bacillus coli communis does not decompose urea into ammonia, and hence the urine remains acid. It is also of interest to note that this germ does not produce an antitoxin.

The differential diagnosis of the more common form of pyelitis in pregnancy, that in the right kidney, is sometimes difficult. Often the kidney cannot be palpated distinctly, the patient's pain is referred to the right lower abdomen, or even to the upper portion of the abdomen and may suggest right-sided pleurisy, appendicitis, catarrhal infection of the gall-bladder, chronic constipation, renal calculi, or salpingitis.

From the pain alone an exact diagnosis cannot be made. Clinically the existence of appendicitis can never be denied in these cases. An intelligent history will often assist in making a differential diagnosis, and a careful physical examination of the chest may enable one to exclude pleurisy. The gall-bladder is so often invaded during pregnancy that a mild infection cannot be denied when indefinite pain and moderate disturbance of the pulse and temperature are present.

When we consider treatment, one may naturally inquire first, What would be the fate of these patients without medical attention? The development of surgical kidney, septicæmia, and death have been reported sufficiently often to show us that such is more than a possibility. In my observation, a patient who refused operation was critically ill for several weeks with repeated chills and fever, finally giving birth to a dead child, and making a tedious recovery. She, however, received good hospital care and medication.

The post-mortem appearances in these cases are learned from a very interesting report by Williamson and Barris (9) in an autopsy made upon a patient dying at St. Bartholomew's Hospital. The bladder was normal, the ureters dilated, containing purulent fluid from which pure cultures of bacteria were obtained. Small abscess cavities were found in the kidneys with degenerative changes in the tubular epithelia.

The patient from whom these specimens were obtained was treated by medicinal means and seemed to be improving, with normal temperature, when the ureters were catheterized under anæsthesia, to determine the condition of the renal pelves. This manipulation was followed by cyanosis, rapid breathing and death. In this case, the infection seemed to have come through the blood-stream. A pleural effusion was thought to be caused by the same organism.

Medicinal treatment is sufficiently successful in mild cases to warrant its prompt and thorough employment.

Andrews' (1) success in 19 cases at the London Hospital with medicinal treatment only, with one induction of labor, illustrates what can thus be accomplished. The essentials of this treatment are rest, milk diet, purgation, the use of salt solution by continuous instillation at intervals, and the administration of hexamethylenamine with local applications over the kidney. This treatment mitigates the patient's pain. It is a familiar observation with obstetricians that mild cases do well under this treatment.

When, however, this does not promptly control the case, and the leucocytosis increases, the patient's temperature is higher, chills develop, and the toxæmia is worse, more radical treatment is indicated.

The suggestion to induce labor or to empty the uterus is natural under the circumstances, but we believe mistaken. Stoeckel's (8) remark that pyelitis is a complication of pregnancy and that pregnancy is not a complication of pyelitis, is exceedingly pertinent. The obstetrical rule should prevail that in all cases of acute infection complicating pregnancy, labor should not be induced; that the complications should be treated, and nature allowed to take care of the pregnancy. It must be remembered that the goal of the obstetrician is the saving of both the life of the mother and child, and that no case can be considered completely successful which fails in this.

The induction of labor may add fuel to the fire, as illustrated in a case reported by Sauvage (7), where pregnancy was interrupted with the death of the child, and as improvement did not follow nephrotomy was practiced, followed by the death of the mother.

We cannot agree with Burnett (2) in his advocacy of the induction of labor.

The effort to drain and disinfect the kidney without incision is frequently made by catheterizing the ureters and irrigating the pelvis of the kidney. In favorable cases this may be done without anæsthesia, and good results are reported by those who have had experience in this treatment. In early pregnancy this method has been successful, and is certainly worthy of trial.

Neither medical treatment, the induction of labor, nor catheterization of the ureters with irrigation of the pelvis of the kidney, efficiently

deals with the infected condition often present in the right lower abdomen. Whether this be appendicitis or a possible salpingitis, it is essential that the abdomen be explored and the appendix or infected tube removed. As an aid in determining which kidney is enlarged and the degree of enlargement, pyelography by the X-ray has been successful in the Strassburg clinic, as reported by Schickele (6). By this method the kidneys may be distinctly outlined, and often the dilated ureters traced, and valuable information gained as regards the site and method of operation. Should the ureters be shown, by this method, to be greatly dilated, and both kidneys be involved, the case would be suitable for catheterization of the ureters, and irrigation of the kidneys. Should one kidney be distinctly palpable, it may be drained by incision, with the removal of the appendix; and should this not be sufficient, the ureters subsequently catheterized.

Operations upon the kidney in pregnancy should not be considered as the last resort, with an unfavorable prognosis. Pousson (5) at the French Congress of Gynecologists in 1910, in 66 cases of nephrectomy with following pregnancy had 59 patients delivered at term, most of them nursing their children, and one becoming a wet nurse. Pinard removed a tuberculous kidney, the patient afterward passing through a normal pregnancy. Within a few months in one of our wards, a pregnant woman from whom one kidney had been removed for tubercular infection recovered from eclampsia. In 8 of Israel's cases with tubercular kidney with nephrectomy, there occurred subsequently 15 pregnancies uncomplicated, followed by normal labor. Hartmann reported 113 renal operations on women, 35 during pregnancy and 78 followed afterward by pregnancy. Among the 351 cases collected was Cragin's vaginal nephrectomy for the removal of a displaced cystic kidney in the pelvis which was obstructing labor. This was followed by normal delivery. The experience of others coincides, and it is interesting to note that operations upon the kidney during pregnancy, accompanied by disturbance of the uterus, often do badly, while in cases where pregnancy remains undisturbed the prognosis is good. During pregnancy itself tuberculosis of the kidney is fortunately rare, as shown in the experience of Guy's Hospital, where in the last twenty years no case of pregnancy with tuberculous kidney has been observed.

I desire also to report a case of intestinal infection in which, by exclusion, the diagnosis of bacillus coli communis infection is most reasonable.

An ill-nourished primipara from semitropic regions, after spontaneous labor with living child, developed fever. Examination of the blood failed to reveal streptococci, nor were the usual signs of puerperal septic infection present. The fever was characterized by considerable elevation with sharp depression and rigors of moderate severity. As the patient did not improve and abscess could not be found, it was thought that possibly she had pyosalpinx, or some obscure collection of pus. Her symptoms were fever, malaise and diffuse abdominal pain without distention or resistance while peristalsis, though impaired, was present.

On section the pelvic organs were normal, excepting a small fibroid nodule on the posterior wall of the uterus. The appendix was enlarged at its base, there were slight but recent adhesions between the coils of intestine, and part of the transverse and the entire descending colon was thickened, red, and at one point beneath the peritoneal covering showed an ulcerated portion. The appendix was removed, adhesions separated, the fibroid nodule removed from the uterus and a Mikulicz gauze bag placed at the bottom of the pelvis, with a cigarette drain to the former site of the appendix. These drains were gradually removed. The patient made a tedious recovery complicated by phlebitis of moderate severity. The Widal typhoid reaction was negative. Examination of the stools for amœbæ was negative. There was no evidence of syphilis or tuberculosis, and the most reasonable diagnosis was colon bacillus infection of the large bowel. The tip of the appendix was practically normal, the base thickened and red.

In the *American Journal of Obstetrics*, 1896, xxxiv, No. 2, I reported a cæsarean hysterectomy followed by death, with symptoms of abdominal infection. At autopsy the field of operation by bacteriological examination was sterile. The lining of the intestine was ulcerated and infection had spread from these ulcers to the lymphatics of the peritoneum. The tests for typhoid, syphilis, tuberculosis and streptococcus infection were negative. The history showed that shortly before coming into labor, the patient had taken violent irritant purgatives, hoping to terminate pregnancy with the death of the child.

We know that the colon bacillus is the germ most frequently present in the intestine, and most often producing infection of the intestine and surrounding viscera. Clinical infection from this source is characterized by moderate fever, with sharp descent, rigors, malaise and the absence of signs, in many cases, of abscess. Abdominal pain is often referred to the large bowel, especially in the region of the appendix. Many of these cases undoubtedly recover with medical treatment only, but where improvement in a reasonable time does not follow such treatment, the patient growing worse, I believe that section should be done. The appendix should be removed, adhesions loosened, collections of pus emptied and extensive drainage instituted. Salt solution should be given at the time of operation by intravenous injection, and afterward by the drop method in the bowel. Food must be limited

to substances leaving no residue and stimulation freely employed.

These cases are reported to call the attention of the profession to the feasibility of surgical treatment for this condition in severe cases which do not improve after a reasonable time, and while under accurate observation with medicinal treatment.

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A NOTE AS TO THE RECOGNITION OF THE URETER

Report of a Case of Anastomosis of the Ureter into the Appendix

By WAYNE BABCOCK, M. D., Philadelphia

During abdominal and especially pelvic operations it is ofttimes of advantage to quickly and positively recognize the ureter. While by painstaking search the ureter may usually be distinguished from other structures, if the tube is greatly displaced or embedded in new tissue or altered in caliber it may be found difficult to positively identify the structure.

Some time ago on exposing, by the extraperitoneal method, a ureter containing a stone, we found a tube of the size and thickness of small intestine. It so closely resembled bowel that for a moment we hesitated to incise it. It was found, however, to have periodic peristaltic movements which differed from those of the small bowel. They were excited by stroking the tube and they also occurred spontaneously at equal and rather frequent intervals of time. These movements were so pronounced that they could readily be demonstrated to students seated a number of feet from the operating table. Later on studying normal ureters during the course of intra-abdominal operations, the peristaltic movements were found to continue regularly during the course of the operation, and they could easily be seen through the overlying peritoneum.

We have thus, by the characteristic peristaltic waves, been able repeatedly to positively identify the ureter and to demonstrate it to others. Through the peritoneum the inosculating perireteral blood-vessels that form fairly coarse oval loops may be seen. During the peristaltic wave the caliber of the tube is not only diminished but the ureter, marked by the attached vessels, may be seen to slide upward, and then after a momentary pause, downward under the peritoneum. The movements are quite rapid, cover several millimeters and are succeeded by a fairly long interval. In one patient recently we found the interval to be 28 seconds. On stroking the ureter it became 12 seconds. There is no other columnar or tubular structure in the body that shows this type of peristaltic movement. In the intestines the peristalsis takes the form of succeeding waves and in the ureter the contracting wave is usually less apparent, the chief impression being the longitudinal sliding or trombone movement. It suggests the intermittent sliding of valve rods seen on steam vessels. Although certain ureters show a primary change in diameter with elevation of the tube, intestinal movements also have not the same orderly succession of peristaltic movement, and instead of being excited by stroking or manipulation they usually soon cease after the abdominal cavity has been opened. Any surgeon who will, for a brief period of time, expose

the deep structures passing over to the pelvic brim in the region of the sacro-iliac synchondroses should be able to recognize the ureters by this simple method.

ANASTOMOSIS OF THE URETER INTO THE APPENDIX

Bernays Kennedy[1] suggests the feasibility and advantage of anastomosing the ureter into the appendix. This operation I carried out three years ago in the following case:

Mr. S. C., age 40, was admitted to the Samaritan Hospital April 1, 1910. He had an advanced carcinoma of the bladder with much cystitis and was emaciated, debilitated and toxic. On April 1, 1910, spinal anæsthesia was used, a suprapubic cystotomy was done, and the growth partially removed. It was found to be so extensive as to preclude any conservative operation. It was decided, therefore, to anastomose the ureters with the bowel in the hope of being able later to do a radical cystectomy. The advantage of introducing the ureter into the appendix suggested itself. It did not seem as feasible, however, with the septic suprapubic opening to introduce both ureters into this organ. On April 22, 1910, through an incision above the crest of the ilium, the retroperitoneal tissues upon the right side were exposed and the ureter isolated, divided and brought into the field. A small incision was then made through the posterior peritoneal wall and the appendix pulled through and made extraperitoneal. The tip of the appendix was excised and the end of the ureter affixed by fine sutures which were carried into the lumen of the appendix and through the appendicular wall. These were tightened and the end of the divided appendix united by other sutures to the adjacent wall of the ureter. It seemed desirable to have a portion of the ureter in contact with the appendix not lined by mucosa. The discrepancy in the size of the two tubes and the thick mucous lining of the appendix rendered it somewhat difficult to get a satisfactory and apparently water-tight approximation. The left ureter was divided and embedded in the rectum. The patient was a very unsatisfactory subject and progressively failed and died April 24, 1910. The extraperitoneal anastomosis was selected in order to avoid intraperitoneal leakage.

By closing the peritoneum carefully about the base of the appendix and avoiding any interference with the appendicular vessels and the mesoappendix the operation may be done with little danger of peritoneal infection. The anastomosis of both ureters into the appendix evidently would be a more difficult procedure and could be done more conveniently and with less ureteral displacement by an intraperitoneal operation. We are of the opinion that the operation of uretero-appendiceal anastomosis possesses no very great advantage, as it does not obviate the secondary cicatricial contraction of the divided end of the ureter, the stenosis thus produced being, we believe, one of the great causes of the secondary renal infections after these operations.

[1] Surg., Gynec. & Obst., 1912, xv, 464.

A METHOD OF MARKING IMPORTANT FIELDS ON THE MICROSCOPIC SLIDE

By HARRY H. HART, Baltimore
Radiologist and Pathological Photographer, Private Hospital of Howard A. Kelly, M. D.

THE pathologist frequently finds a particularly good spot on the slide when examining a specimen under the microscope which it is desirable to mark for future use, especially when the specimen is to illustrate an article with photomicrograph or drawing.

I have devised a simple method of so marking which enables the pathologist to show his artist or photographer the exact field desired and also furnishes a guide in estimating the magnification of a given field in a given sized picture. A number of slides may be marked at one time and the illustrations made later.

The only appliances necessary are some square white gummed labels a trifle larger than the cover glass and a tool used by dentists, known as Ainsworth's rubber dam punch (Fig. 1). This has a rotary device for cutting various sized holes, from the size of a pin-point up to one of 2 mm. diameter.

A hole just including the field desired is punched in the center of one of the labels and the latter is then slipped over the slide and under the objective while the operator continues to view the field through the microscope. When the opening in the paper exactly coincides with the field of vision, the label is fastened to the cover-glass by moistening the corners only (Fig. 2). If, for instance, a circular picture of 90 mm. diameter at a magnification of 60 diameters is required, it will be necessary to punch a 1½ mm. hole. The field included in the finished picture will then be the same as that seen microscopically. The same plan may be used for high powers by decreasing the size of the punch-hole as the magnification is increased. When using

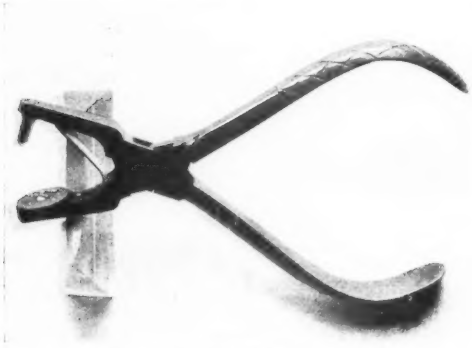

Fig. 1. Ainsworth rubber dam punch

this device for photomicrography, I usually loosen one end of the label and push it aside and get rid of any minute fibers of paper which might tend to obstruct the field, after the slide is properly centered and all is ready for the exposure of the negative.

The following methods of marking slides are the only ones in use heretofore which I have been able to find:

(*a*) Marking a circle on the cover-glass around the field with a pen and ink; a very crude method.

(*b*) Using a pointer of gummed paper pasted on the cover glass; this is useful to mark a particular object, but does not give a circumscribed field.[1]

[1] For a fuller description of methods B and C, see Paul N Hasluck's "Book of Photography." The brush marker (D) is described in detail by Professor Simon Henry Gage, in his standard work on the microscope.

Fig. 2. Slide with label in place.

(*c*) Maltwood's finder, consisting of a glass the size of a slide ruled in minute squares. Each square contains two numbers which serve to identify the horizontal and vertical position of the square. The specimen to be marked is correctly placed under the objective, and its position on the stage of the microscope noted by means of the mechanical stage. The slide is then removed and the finder substituted. The numbered square, or squares, which appear in the field will then serve to identify the field for future reference, it being necessary to place the slide in exactly the same position on the stage each time. This method would not be satisfactory with microscopes not fitted with mechanical stages.

(*d*) A marker consisting of an objective-like attachment which screws into the nose-piece of the microscope. This carries a small brush which is dipped in colored shellac, and made to rotate around the field, thus enclosing it within a dark ring. The position of the brush may be changed to vary the size of the circle.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 7, 1913, WITH THE PRESIDENT, DR. M. L. HARRIS, IN THE CHAIR

Previous to the papers Dr. Bevan arose to a question of personal privilege and said:

DR. ARTHUR DEAN BEVAN: As a question of personal privilege I wish to correct a statement I made, I think, at the last meeting of the Chicago Surgical Society in regard to an apparatus which is made by Dr. Lemon, of Milwaukee. In a meeting before the Western Orthopedic Association, I understood Dr. Ridlon to say that this apparatus of Lemon, of Milwaukee, was a modification of one which he had modified from the Bartlett apparatus, of Boston, and I made that statement in a discussion before this society. Since that time Dr. Lemon and Dr. Ridlon have both called my attention to the fact that the apparatus which Dr. Ridlon referred to was not Dr. Lemon's apparatus, but the apparatus of another Milwaukee surgeon. As a question of personal privilege and in justice to Dr. Lemon, I desire to correct the statement made in a former discussion, so that this fact will appear in the minutes of the Chicago Surgical Society.

DR. ALFRED STRAUSS read a paper (by invitation) entitled "An Artificial Ureter Made from the Abdominal Wall." (See p. 78.)

DISCUSSION

DR. L. L. MCARTHUR: I stand here simply as a sponsor for this paper and do not propose to enter into a discussion of it because I know very little about the experimental work that has been detailed to you this evening, but after seeing the slides and hearing the work of one of my former internes I felt that it was of such importance that the Surgical Society of Chicago was entitled to hear it first. I believe that the work is indicative of practical application to the human being and one which will be really epoch-making in the way of advance for the replacement of those portions of the ureter which are occasionally of necessity sacrificed in a surgical procedure or destroyed by disease or by neoplastic infiltrations. The work has been one of the first contributions which have come out of the new institution for scientific research at the Michael Reese Hospital, and is one worthy to be included in the volume of experimental research, one of which we, as members, of that institution are, I think, justly proud.

DR. DEAN LEWIS: The piece of work that has been described by Dr. Strauss is very interesting. Surgeons have been slow in inventing and adopting new procedures for the repair of ducts. Recently Dr. Carl Davis and myself have attempted to repair and reconstruct the common bile duct with living transplants, for reconstruction of the duct by a rubber tube, as recommended by Sullivan and Wilms, has never seemed to me to be entirely satisfactory. Fascia apparently is highly resistant to bile and urine, providing there is no infection. We have reconstructed the common bile duct by using free fascial transplants. After cutting the duct we have removed a piece of the sheath of the rectus muscle and have joined the two ends by a fascial tube, much as Dr. Strauss has united the ends of the divided ureter. The fascia has been transplanted free without a pedicle. The fascia lives, there being no evidence of necrosis. In practically all cases there has been some dilatation of the duct above the transplant, but bile has passed on into the intestine.

We have done the same thing with the ureter. The ureter has been divided and the two ends have been united by a fascial tube, the fascia being transplanted free. In the procedure employed by Dr. Strauss I do not believe that the pedicle is necessary to preserve the life of the transplant. There is more or less dilatation of the ureter above the transplant and some hydronephrosis, but urine passes beyond the point where the transplant was inserted. I believe that in both the common duct and ureter the dilatation above the point at which the transplant was inserted is due to an interruption of the rhythmical waves which pass over these ducts. I believe that the method can also be used to reconstruct the salivary ducts in cases

of salivary fistula. These fascial transplants are apparently easily killed by infection and this, of course, may prevent a wide application of the principle we have advocated.

DR. CARL BECK: The paper of Dr. Strauss is highly interesting, not only on account of the microscopical findings but also on account of the advantage of using local tissues for the first time as transplants. It seems to me, however, that another principle, which is much more simple, enters into this work. I have a case in which I have used it. Where there is a partial loss of the ureter other structures can be used. I refer to the principle of using a part of the bladder as a transplant. It is a principle which has been used in the formation of the œsophagus. Some years ago we showed such a specimen before the Chicago Medical Society in conjunction with some work I did with Dr. Carrel. It consisted of the formation of an œsophagus from a flap which was cut parallel to the large curvature of the stomach, then turned upward and formed into a tube which was joined to the œsophagus. This operation has recently been mentioned in the literature under other names than ours, but as our report of our experimental work was published only in the Proceedings of the Chicago Medical Society it has not found its way into the general literature. The same principle can be used to make quite a long ureter from the bladder, taking a portion of the wall and leaving it in connection with the wall, and so-called cysto-enterostomy by Boari, and using a flap as long as you want it. This work demonstrates that a considerable portion of the ureter can be replaced from the wall of the bladder. It is physiological tissue which can be used for reconstruction. The same can also be used for the common duct from the intestine.

DR. DANIEL N. EISENDRATH: The great difficulty, as has been pointed out by Dr. Strauss, with all ureteral plastics has been that the ureter sooner or later eats up the structure that you have transplanted on account of the irritating action of the ureter, and sooner or later becomes converted into cicatricial tissue which presses upon the proximal and distal portions of the ureter, in which we get stenosis at the point of transplantation with subsequent hydronephrosis. At the time, I thought that if we could get some structure which was accustomed to the presence of urine, like the urinary bladder itself, we might solve the problem of these transplantations successfully. I did not know at that time of Boari's work, and a free transplant was made between the ends of the ureter in the manner Dr. Strauss has carried out, believing that this would overcome any cicatricial tissue. We pursued a technique practically the same as that of Dr. Strauss, and as almost everyone would working in this field. Those who have used arteries or veins have inserted them between the ends and then sutured them, but the method pursued by myself and Dr. Strauss in a modified manner was to take the transplant and make a sort of pseudo-bladder of it. Dr. Strauss succeeded in uniting the distal edge, put in so as to project after the manner spoken of by Dr. Beck in the reimplantation of the intestine. We obtained a number of successful unions by this method. A number of the dogs died from sloughing of the flaps. The flaps did not live and we had perforation and urinary fistula, which would open toward the outside. At other times the urine would escape into the peritoneal cavity and we had peritonitis. The dogs that lived, as we found in our experiments, had hydronephrosis, the result of contraction of the transplant with dilatation above it.

DR. ALFRED STRAUSS (closing the discussion): With reference to the remarks made by Dr. Lewis concerning experiments on the bile ducts, his statement speaks in favor of my hypothesis regarding an acid or peculiar chemical reaction of the urine causing some slight degenerative change in the fascia which produces infiltration, cartilage formation and bone formation.

Another point which favors this hypothesis is the transplantation of fascia to bile ducts, the bile being an alkaline medium which causes no chemical irritation and therefore no changes in the fascia. For instance, I believe Dr. Lewis has transplanted the fascia lata into the abdominal wall and areolar fatty tissue, both of which have an alkaline or neutral reaction, and the transplant does not change its character. This again speaks in favor of the acid or peculiar chemical reaction that causes this metaplasia.

Question. Has Dr. Strauss made any free transplants?

Answer. Yes; I have three living dogs operated three months ago in which the same technique was used, except that a free instead of a pedicle transplant was used. My experience with this technique on the common bile duct has produced mostly negative results.

AMERICAN COLLEGE OF SURGEONS

HISTORICAL

THE American College of Surgeons was organized at a meeting held in Washington on Monday evening, May 5, 1913. Four hundred and fifty surgeons of the continent of North America came together at the invitation of an Organization Committee which had been appointed by the Clinical Congress of Surgeons of North America at its meeting in November, 1912. This committee consisted of Edward Martin of Philadelphia, Emmet Rixford of San Francisco, John B. Murphy of Chicago, Rudolph Matas of New Orleans, Albert J. Ochsner of Chicago, Charles H. Mayo of Rochester, Minn., Frederic J. Cotton of Boston, George Emerson Brewer of New York, J. M. T. Finney of Baltimore, W. W. Chipman of Montreal, George W. Crile of Cleveland and Franklin H. Martin of Chicago.

The invitations which resulted in this large gathering of surgeons in Washington were extended by the Organization Committee after a carefully prepared campaign in which each large university city on the continent was visited by a member of the committee who met, in person, a group of selected men brought together by a committee of three in each locality, which committee had been authorized by the Organization Committee to extend an invitation to the surgeons in their locality to meet the representative of the Organization Committee. These five hundred men who were invited to the meeting in Washington, four hundred and fifty of whom responded, represented all branches of surgery and surgical specialties.

ORGANIZATION

At this meeting in Washington, called for the purpose of effecting an organization, the Committee on Organization presented a definite tentative plan, which plan included a call of the meeting, the presentation of by-laws, the presentation of resolutions, and a plan for the completion of the organization by the election of governing bodies and executive officers.

CALL OF THE MEETING

The men were called together by Edward Martin, Chairman of the Committee, who called for the reading of the Call of the Meeting.

The Call of the Meeting was read by Franklin H. Martin, Secretary of the Committee. This call, which is herein quoted in part, summarizes the work for which, in the opinion of the committee, the American College should stand:

"First. It should formulate a minimum standard of requirements which should be possessed by any authorized graduate in medicine who is allowed to perform, independently, surgical operations in general surgery or any of its specialties.

"Second. It should consider the desirability of listing the names of those men who desire to practice surgery and who come under the authorized requirements.

"Third. It should seek the means of legalizing under national, colonial, state or provincial laws, a distinct degree supplementing the medical degree, which shall be conferred upon physicians possessing the requirements recognized by this law as necessary to be possessed by operating surgeons.

"Fourth. It should seek co-operation with the medical schools of the continent which have the right to confer the degree of M. D. under the present recognized standards, and urge these colleges to confer a supplementary degree on those of its graduates who have, in addition to their medical course, fulfilled the necessary apprenticeship in surgical hospitals, operative laboratories, and actual operative surgery.

"Fifth. It should authorize and popularize the use of this title by men upon whom it is conferred, and its use should especially be urged in all directories of physicians in order that the laity as well as medical men may distinguish between the men who have been authorized to practice surgery, and those who have not."

The founders' organization was completed by the election of a chairman and a secretary, and the authorization of an order of business. The meeting then proceeded to complete the organization by adopting by-laws, rules and regulations and electing governors, regents and officers.

BY-LAWS

I. NAME. The name of the corporation shall be the American College of Surgeons.

II. OBJECT. The object of the College shall be to elevate the standard of surgery, to establish a standard of competency and of character for practitioners of surgery, to provide a method of granting fellowships in the organization, and to educate the public and the profession to understand that the practice of surgery calls for special training, and that the surgeon elected to fellowship in this College has had such training and is properly qualified to practice surgery.

III. THE COLLEGE. 1. The College shall consist of all members of the corporation. Such members are to be designated as Fellows. The College shall vest the general management of the corporation in a Board of Governors. The Board of Governors shall in turn vest the details of the management in a board of trustees to be known as the Board of Regents.

2. The College shall hold an annual meeting on the day and at the place selected for the annual meeting of the Board of Governors.

IV. BOARD OF GOVERNORS. 1. The original Board of Governors shall consist of the surgeons invited by the Organization Committee to serve as founders of the College, who have qualified as Fellows. The members of this first Board of Governors shall also be known as the Founders of the American College of Surgeons.

2. The original Board of Governors shall be divided by lot into three classes to serve one, two, and three years respectively. At the annual meeting in 1914, and at the annual meeting in each year thereafter, the Fellows of the College shall elect (in a manner to be determined by the Board of Regents) fifty surgeons from among the Fellows of the College to membership on the Board of Governors, each to serve for a term of three years; thirty of these members are to be elected from a list of nominations, consisting of three members each, nominated by the following fifteen surgical associations and societies of North America, and one each from the United States Army and from the United States Navy.

1. American Surgical Association.
2. Surgical Section of the American Medical Association.
3. Section on Obstetrics, Gynecology, and Abdominal Surgery of the American MedicalAssociation.
4. General Surgical Division of the Clinical Congress of Surgeons of North America.
5. Division of Surgical Specialties of the Clinical Congress of Surgeons of North America.
6. American Gynecological Society.
7. Southern Surgical and Gynecological Association.
8. Western Surgical Association.
9. Section on Surgery of the Canadian Medical Association.
10. American Association of Obstetricians and Gynecologists.
11. American Orthopedic Association.
12. American Association of Genito-Urinary Surgeons.
13. American Laryngological Association.
14. American Ophthalmological Society.
15. American Otological Society.

Twenty members shall be elected at large to represent surgeons of North America not affiliated with the above societies or associations. In case of failure of any of the above named organizations to make its quota of nominations, or in case of duplication of nominees, the Board of Regents shall nominate members from among the Fellows at large for the vacancies so caused in the list of nominees. The Board of Regents shall in the same manner fill all vacancies in the current membership of the Board of Governors due to death, resignation, or other causes.

3. The Board of Governors shall at its first meeting elect from its own membership twelve who shall be members of the Board of Regents; this group shall be divided into three classes of four members each, whose terms of office shall expire in one, two, and three years respectively. As the term of service in each class expires, their successors shall be elected, each for a term of three years. Not more than three of each class shall be selected from one country. In the event of death or resignation of any member of the Board of Regents, his successor shall be elected at the next regular or special meeting of the Board of Governors, but the Board of Regents may appoint a member of the Board of Governors to serve as Regent until this election takes place.

4. The Board of Governors shall meet in executive session annually for the transaction of business, which business shall include the election of members of the Board of Regents and the election of officers as provided in Article IV, Section 3, and other routine business which may be brought before it by the corporation or the Board of Regents. Such meetings shall be called by the Secretary at the direction of the Board of Regents. Special meetings of the Board of Governors may be called by the Secretary at any other time at the request of the Board of Regents. Members of the Board of Governors shall be expected to attend other formal meetings and convocations called by the Board of Regents for the purpose of conferring fellowships and the transaction of other business.

5. Fifty members of the Board of Governors shall constitute a quorum for the transaction of business.

V. OFFICERS. The officers of the College shall be a President, a First Vice-President, a Second Vice-President, a Treasurer, and a General Secretary. Such officers shall be elected by the Board of Governors from among the Fellows of the College, each for a term of one year, and shall serve until their successors are elected. The President, the General Secretary, and the Treasurer shall upon their election to office become members of the Board of Regents.

(*a*) The President shall preside at all regular and special meetings of the College and of the Board of Governors and at all convocations for the conferring of fellowships.

(*b*) The Vice-President shall preside at all meetings of the College in the absence of the President, and in the event of the death or resignation of the President, shall assume the duties of that officer.

(*c*) The General Secretary shall keep all records of the Corporation, of the Board of Governors and of the Board of Regents, shall mail to the proper addresses all notices of regular and special meetings of the College, of the Board of Governors and of the Board of Regents and shall have a general supervision of the business affairs of the Corporation under the direction of the Board of Regents.

(*d*) The Treasurer shall receive all funds of the College and disburse the same on checks, signed by him and countersigned by the Secretary. He shall make a report in writing to the Board of

Regents at each meeting of that Board of the moneys received and expended, and shall furnish a detailed statement of the financial condition of the College at each annual meeting of the Board of Regents. The Treasurer shall furnish a bond to the Board of Regents for the faithful performance of his trust.

(*c*) In the event of the death or resignation of the General Secretary or Treasurer, the Board of Regents shall elect his successor from among the members of the Board of Governors to serve until the next annual meeting of the Board of Governors and until such time as his successor is elected and qualified.

VI. BOARD OF REGENTS. 1. The Board of Regents shall consist of the President of the Corporation, the General Secretary of the Corporation, the Treasurer of the Corporation, and twelve members of the Board of Governors elected as hereinbefore provided.

2. The duties of the Board of Regents shall be those ordinarily performed by a board of trustees, namely: the transaction of all detail business devolving upon the Board of Governors in carrying out the object of the organization; the regulation and conserving of its property interests; the creating, appointing, and directing of all standing committees; the election of Fellows to the College; the calling of all meetings of the Corporation not already provided for; the arrangement of convocations or other meetings for the conferring of Fellowships; the transaction of all business not otherwise provided for, that may pertain to the Organization.

3. The officers of the Board of Regents shall be a Chairman and a Secretary.

(*a*) The Chairman of the Board of Regents shall be elected from among the members of the Board of Regents for a term of one year and shall preside at all meetings of the Board. In the event of his death or resignation, the office shall be filled by election at the next meeting of the Board.

(*b*) The General Secretary of the Corporation shall be the Secretary of the Board of Regents.

4. The Board of Regents shall elect the following committees: 1, Credentials; 2, Standardization of Fellowships; 3, Legislation; 4, Graduate schools and hospitals.

(*a*) Each standing committee shall consist of five members, the Chairman of which shall be a member of the Board of Regents. The other four members may be selected from the Board of Governors or from the body of Fellows of the College.

(*b*) Other standing committees may be elected from time to time by the Board of Regents.

5. Eight members of the Board of Regents shall constitute a quorum for the transaction of business.

6. Regular meetings of the Board of Regents shall occur once in six months on the call of the Secretary. Special meetings may be convened at any time by the Secretary, or on a request to him made in writing and signed by thirty members of the Board of Governors, or eight members of the Board of Regents.

VII. FELLOWS. 1. The Fellows of the College shall be graduates in medicine who are licensed to practice medicine in their respective states and provinces, or medical officers of the federal services, who have made an application for fellowship (such application being endorsed by three Fellows of the College, one of whom shall be a member of the Board of Governors) who meet the qualification requirements that shall from time to time be established by the Board of Regents, and who shall be elected to fellowship by the Board of Regents on recommendation of the Committee on Credentials and who shall have signed the roll.

2. Each individual elected to Fellowship in the College shall be designated as a Fellow of the American College of Surgeons and shall be authorized and encouraged to use the letters F. A. C. S. after his name on professional cards, in professional directories, and in articles published in surgical literature.

VIII. FEES. An initial fee of twenty-five dollars shall be required of each member of the College on his election to Fellowship by the Board of Regents. A fee of five dollars shall be required each year for five years. A payment of fifty dollars at entrance shall relieve the member of further payments.

IX. PUBLICATIONS. The Board of Regents shall issue each year a directory containing the names and addresses of the Fellows of the American College of Surgeons arranged by states, provinces, and colonies.

X. Any member of the College may be expelled for conduct which in the opinion of the Board of Regents is derogatory to the dignity of the College or inconsistent with its purposes. Such expulsion must be voted by a majority vote of the whole Board of Regents at any meeting, to which meeting the member against whom charges are made shall be invited to be present, and may appear or may be represented, in a manner to be determined by the Board of Regents.

XI. These by-laws may be amended by a majority vote of those present at any regular or special meeting of the Board of Governors, or at a meeting called for the purpose on request made in writing by a hundred members of the Corporation, provided that such proposed amendments are included in the call of the meeting at which such action is contemplated.

OFFICERS

President, J. M. T. Finney, Maryland; First Vice-President, W. W. Chipman, Quebec; Second Vice-President, Rudolph Matas, Louisiana; Treasurer, Albert J. Ochsner, Illinois; General Secretary, Franklin H. Martin, Illinois.

BOARD OF REGENTS

J. M. T. Finney, Maryland; Albert J. Ochsner, Illinois; Franklin H. Martin, Illinois; George E. Brewer, New York; George E. Armstrong, Quebec; John B. Murphy, Illinois; Edward Martin, Pennsylvania; Frederic J. Cotton, Massachusetts; Herbert A. Bruce, Ontario; Charles F. Stokes, Washington, D. C.; William D. Haggard, Tennessee;

George W. Crile, Ohio; Robert E. McKechnie, British Columbia; Charles H. Mayo, Minnesota; Harry M. Sherman, California.

SELECTION OF FELLOWS

It was determined by the organization to admit surgeons to Fellowship under two groupings: First, the charter members, consisting of surgeons of distinction and ability who have been in the practice of medicine not less than eight years and who, in the opinion of the Board of Regents, should be entitled to Fellowship without the formality of an examination; second, those who should be required to submit to an examination or other test of qualification required by the Board of Regents. It was decided to limit the time of admission of the first group of charter members to November 1, 1914, and to postpone the admission of Fellows by examination until the Board of Regents had formulated detailed plans of a satisfactory nature for admission by this method, not earlier than November 1, 1913.

APPLICATION FOR MEMBERSHIP.

The Board of Regents at its earlier meetings announced that it would be the spirit of the association to open the fellowship to all competitors in surgery without favor. The Board of Regents is anxious to have every surgeon on the continent who can fulfill the membership requirements become a Fellow of the organization. The General Secretary is therefore instructed to send application blanks to any legally qualified practitioner of medicine on the American continent who may signify his desire to become a member.

METHOD OF SELECTING FELLOWS

The by-laws specifically state that the Fellows of the College "shall be graduates in medicine who are legalized to practice medicine in their respective states or provinces and who meet the qualification requirements that shall from time to time be established by the Board of Regents."

The application blanks are uniform and each applicant for membership is required to file an application blank filled out in detail and signed. The blank contains the following questions and specifications:

Name. Address. Place and date of birth.
What school, academy, college or university did you attend? Date of graduation? Degrees?
What medical college or colleges did you attend? Date of graduation? Degrees?
In what hospitals have you been an interne, resident or assistant? From ——— to ———?
In what hospitals have you been a staff member and in what capacity?
In what teaching capacity have you been active?
What other appointments have you had?
What post-graduate studies have you pursued in America and where?
What post-graduate studies have you pursued abroad and where?
What official positions have you held?
How many years in special practice and where?
What department of special practice?
What percentage of your work is surgical?
What research or experimental work have you done?
Of what medical societies are you a member?
Give the names of five prominent surgeons as references, at least three of whom are from your own state.
Give the names of books and contributions to medical and surgical literature of which you are the author, with date and place of publication.

Signed ———

Date ———

The application papers contain a separate declaration against the practice of fee-splitting. This is in the nature of a personal pledge and each applicant is required to attach his signature to it and file it with his papers.

REFERENCE BLANK

While the by-laws require that an applicant give three endorsers, the Committee on Credentials now recommend that five names be given, three of which should be from the applicant's own state. The reference blank contains the following questions and answers:

Name. Address. College and date of graduation.
1. How long have you known the applicant?
2. What is his surgical standing in the profession?
3. What is his experience as a surgeon?
4. How extensively does he specialize?
5. What special training in surgery has he had?
6. What is his moral standing in his community?
7. What is his ethical standing?
8. Do you believe he will carry out in practice the spirit of the enclosed declaration?
9. Do you believe from your knowledge of the applicant's life that we can accept in good faith his fulfillment of the principles involved in the enclosed declaration if signed by him?
10. Do you believe he is in every way qualified for Fellowship in the American College of Surgeons?
11. Remarks.

COMMITTEES ON CREDENTIALS

The Board of Regents has authorized Committees on Credentials consisting of the Central Committee, which reports directly to the Board of Regents, and State and Provincial Committees, which report to the Central Committee on Credentials.

The Central Committee on Credentials holds its meeting in the office of the College, where the members can have access to all papers and correspondence filed in connection with each candidate.

The State and Provincial Committees, each consisting of from five to seven members, are located in nearly every state in the United States and in four divisions of Canada.

DUTIES OF COMMITTEES ON CREDENTIALS

The name of each applicant for fellowship, together with the names of his references, is sent by the Central Committee on Credentials to the State or Provincial Committee which has jurisdiction over the territory in which the candidate resides,

and this local committee, after consideration, makes its recommendations to the Central Committee.

When an applicant's papers are complete, including a report from each of the references given and from the State Committee on Credentials, the Central Committee on Credentials takes up the application for final consideration and recommendation.

When the candidate has successfully passed the final scrutiny of the Central Committee on Credentials, he is recommended to the Board of Regents for election to Fellowship. If, on the other hand, the candidate's papers are found defective or his qualifications are considered below the standard for fellowship required by the College, the Committee on Credentials notifies the candidate by the following form letter:

Dear Doctor: —

Your application to the American College of Surgeons has been considered by our committee on several occasions, but we regret to say that the data submitted are defective to the extent indicated on the accompanying card.

So far, our committee has had submitted to it over 20,000 pages of material for consideration in connection with the various applications for membership, all of which had to be carefully read, and you can readily see that in order to perform our duties thoroughly, we have been compelled to adhere to rules which might seem unreasonably strict, were we not compelled to do this work in an entirely impersonal manner.

We have consequently decided to send this form letter to all applicants whose applications it has not been possible to send to the Board of Regents with our recommendation for election of the applicant. This action is frequently due to the fact that the surgeons given for reference have neglected to send in reports upon which judgment could properly be based.

Accompanying the above letter are two cards: Card "A" indicating the defect in the credentials or documents of the applicant and Card "B" indicating the remedy proposed. The status of the applicant's papers are shown by the underscored lines.

APPLICATIONS FOR FELLOWSHIP

Over two thousand applications for fellowship in the College had been filed up to November 1, 1913, fully one-half of which were voluntary applications. Of this number the Committee on Credentials recommended to the Board of Regents 1057 for fellowship at the first convocation. A large number of the applications still on file will undoubtedly be found to represent successful candidates, when they have been considered by the Committee.

THE FIRST CONVOCATION

The first convocation of the American College of Surgeons occurred in the Gold Room of the Congress Hotel, Chicago, on the evening of November 13, 1913.

The prospective Fellows were invited to sign the roll of membership at this place during the day. The roll was furnished in loose leaf form, and a corps of assistants presided over the formality of signing in a manner to make it possible for a large number to be accommodated in a short space of time. Each page of the roll was headed by a pledge or contract and to this the Fellow appended his signature and address.

EELLOWSHIP PLEDGE

Recognizing that the American College of Surgeons seeks to develop, exemplify and enforce the highest traditions of our calling, I hereby pledge myself, as a condition of fellowship in the College, to live in strict accordance with all its principles, declarations, and regulations. In particular I pledge myself to pursue the practice of surgery with thorough self-restraint and to place the welfare of my patients above all else; to advance constantly in knowledge by the study of surgical literature, the instruction of eminent teachers, interchange of opinion among associates, and attendance on the important societies and clinics; to regard scrupulously the interests of my professional brothers and seek their counsel when in doubt of my own judgment; to render willing help to my colleagues and to give freely my services to the needy. Moreover, I pledge myself, so far as I am able, to avoid the sins of selfishness; to shun unwarranted publicity, dishonest money-seeking, and commercialism as disgraceful to our profession; to refuse utterly all secret money trades with consultants and practitioners; to teach the patient his financial duty to the physician and to urge the practitioner to obtain his reward from the patient openly; to make my fees commensurate with the service rendered and with the patient's rights; and to avoid discrediting my associates by taking unwarranted compensation. Finally I pledge myself to co-operate in advancing and extending, by every lawful means within my power, the influence of the American College of Surgeons.

ACADEMIC ROBE

After careful consideration of the matter and in view of the fact that important convocations at which new Fellowships will be conferred will occur each year, the Board of Regents adopted a distinct fellowship gown which, in their opinion, will add dignity, uniformity, and academic distinction to the formal gatherings of the College.

The gown adopted consists of a body of navy blue mohair. A scarlet velvet facing five inches wide extends around the neck and down each side of the front. The cap is of the same material as the gown, with a scarlet tassel.

PROGRAM

8:00 Fellows and guests assembled.
8:15 Governors assembled.
8:25 Regents assembled with honorary guests.
Invocation by the Rev. J. G. K. McClure.
Presentation of the Roll of Fellows and Honorary Fellows by the Secretary.
Conferring of Fellowships by the President.
Introduction of Honorary Fellows individually by the Regents and conferring of Fellowships by the President.

CONFERRING OF FELLOWSHIPS

Sir Rickman J. Godlee of London was introduced by Regent W. W. Chipman. Before conferring the degree, the President, Dr. J. M. T. Finney, received the candidate and said:

"Sir Rickman J. Godlee, student, versatile author, distinguished surgeon, worthy member of a family whose name is known and honored wherever antiseptic surgery is practiced, President of the Royal College of Surgeons of England, the highest honor within the gift of his professional associates at home. His presence here is a renewed evidence of the mutual high regard and esteem held for each other by the two great English-speaking nations."

The President then conferred upon Sir Rickman J. Godlee an honorary fellowship in the American College of Surgeons.

William W. Keen of Philadelphia was introduced by Regent George W. Crile. Before conferring the degree, the President received the candidate and said:

"William Williams Keen, nestor of American surgery after a professional life covering fifty-two years. As a leader of the Jefferson School of Philadelphia, he links us with the great professional names of the nineteenth century. Army surgeon, teacher, operator, writer, publicist, traveler, patron of art, promoter of the best in higher education, public-spirited citizen; recipient of the greatest gifts in American medicine, Honorary Fellow of the Royal College of Surgeons of England and of Edinburgh, he is honored throughout Europe. Wherever good surgery is regarded, there he is quoted."

The President then conferred upon Dr. William W. Keen an honorary fellowship in the American College of Surgeons.

William Stewart Halsted of Baltimore was introduced by Regent Charles F. Stokes. Before conferring the degree, the President received the candidate and said:

"William Stewart Halsted, surgeon, teacher, investigator, honored at home and abroad; contributor to the progress of science. One of the four distinguished founders of the Johns Hopkins School of Medicine. His gifts to surgical technique, to numerous valuable operations now the standard, and to many great advances in surgical physiology and pathology, have brought to him international renown. Honorary Fellow of the Royal College of Surgeons of England and of Edinburgh — with undiminished vigor he still pursues his valuable career."

Following this, honorary degrees were conferred *in absentia* (candidates being unable to attend because of illness) upon J. Collins Warren of Boston and Robert F. Weir of New York.

FELLOWSHIP ADDRESS

Sir Rickman J. Godlee, President of the Royal College of Surgeons of England, was introduced by the President, J. M. T. Finney, and upon rising, was received with prolonged applause, the entire audience rising to greet him. Before reading his formal address, he presented a greeting to the American College of Surgeons, in the form of an illuminated parchment, from the Royal College of Surgeons of England.

GREETING FROM THE ROYAL COLLEGE OF SURGEONS

We, the Council of the Royal College of Surgeons of England, have heard with much interest of the approaching inauguration of the American College of Surgeons. We hereby convey to it our hearty good wishes, and express the hope that it may have a successful career and fill a position beneficial alike to the Profession and to the Community.

We cannot forget the important advances in the Science and Art of Surgery achieved by many distinguished Surgeons in the Continent of America during the past, and are proud to have enrolled upon our list of Honorary Fellows the names of some of the most active workers in these fields at the present day.

In accepting the invitation for our President to take a part in the opening Ceremony, we desire to show that we appreciate the intention of the American College to strengthen the bonds that already unite the Medical Profession amongst the English-speaking peoples. It is a sentiment which always meets with a cordial response in this Country, and it is one which this College will endeavor to support by all the means in its power.

In witness whereof we have caused the Common Seal of the College to be hereunto affixed this 9th day of October, 1913.

President: RICKMAN J. GODLEE.
Vice-presidents: G. H. MAKINS.
[SEAL] FREDERIC EVE.

Sir Rickman J. Godlee then delivered the formal address to the American College. This address will be printed in full and distributed to the Fellows of the American College of Surgeons and to members of the profession.

ABSTRACT OF ADDRESS

In the first place it was pointed out that it is difficult for anyone, and especially for people living in America, to appreciate the conditions in England at the beginning of the fourteenth century. This was near the end of the middle or dark ages. The military spirit prevailed, science was under a dark cloud, and medicine was not in advance of other sciences. Surgery was not so much respected as medicine. Surgeons indeed were classed with barbers and for the most part belonged to the Barbers' Guild which was formed in 1308. It included those who practiced minor surgery, but the better classes of surgeons held aloof and formed themselves into the Guild of Surgeons.

Reference was then made to the origin of the guilds in the city of London. They were associations or fraternities of artisans for the supervision of the crafts and for regulating the hours of labor. They became important bodies, and elected the Lord Mayor and Corporation.

More than two hundred years later, namely in 1542, the Barbers' Company and the Guild of Sur-

geons united and were incorporated as the Company of Barber-Surgeons. This company existed another two hundred years, namely until 1745. They exercised extensive control over the surgeons of the country. They gave licenses to practice; and sometimes deprived surgeons of their licenses; they supervised the public dissections, which were the only form of anatomical study recognized by law; they appointed lecturers in surgery; possessed a censorship over books, and had other very important duties. The two bodies were, however, incompatible and in 1745 the Surgeons' Company was separated from that of the Barber-Surgeons. In 1800 they were established as the Royal College of Surgeons in London, and in 1843 the name was again changed, by a charter of Queen Victoria, to that of the Royal College of Surgeons of England.

The College of Surgeons had their first quarters in the Old Bailey, and later on moved to their present house in Lincoln's Inn Fields. The ancient titles of Master, Governors, and Court of Associates were changed to those of President, Vice President, and Council. The corporation consisted of the members. In 1843 a new class of members who were called Fellows was formed, from and by whom the Council henceforth was to be chosen, instead of being elected by the Council themselves as had been the case up to this date. The first Fellows were chosen from the members, being elected by the Council chiefly from the surgeons, assistant surgeons, and lecturers of the metropolitan hospitals, and they also included representatives of the naval, military, and Indian forces. But since that time the ordinary portal for admission to the Fellowship has been an examination — or rather, two examinations — which constitute a formidable and searching test of ability. The class of Members now numbers over 17,000; the Fellows number 1589.

Reference was then made to the new American College of Surgeons, and to the methods of recruiting its Fellowship. After describing in some detail the examinations above referred to, a contrast was drawn between the English and American Colleges. Some of the other functions of the English College were passed in review, especially that of the discipline which it can exercise over its Fellows and members. In connection with the examination for the diploma of membership, the question of a uniform system of admission to the medical profession was discussed, and in this connection it was pointed out how in England attempts are being made to secure this result.

In conclusion the relations of the Royal Colleges of Physicians and Surgeons in London was referred to, and the opinion was expressed that as surgery advances, the tendency will be for these two great departments of the profession to be drawn more closely together.

PRESIDENTIAL ADDRESS

President J. M. T. Finney then delivered the presidential address to the Fellows of the College. This address will be printed in full and distributed to the Fellows of the American College of Surgeons and to members of the profession. His remarks in brief were as follows:

"The highest development of the greatest efficiency along all lines of public service relating in any way to our profession." With this as the keynote, the American College of Surgeons was launched by Dr. Finney on what is thought by all concerned to be a career of usefulness for the public at large. "The history of surgery in the United States and Canada," said Dr. Finney, "is opened to a new page. When at some future time the historian comes to write on that page the record of events that have led up to this meeting, he will there record the taking of another step in the progress of medicine in general and of surgery in particular in Canada and the United States. What is consummated here tonight is destined to produce a deep and lasting impression upon medical progress not alone in those countries but indirectly the world over.

"The present and future welfare of the profession has been for a long time uppermost in the minds and very close to the hearts of many of us. We have pictured to ourselves in this connection a profession ennobled by men actuated solely by their desire to devote their time and their talents to the relief of suffering humanity, willing, yes, glad at any time, if need be, to lay down their own lives for those of their fellow-men; whose membership should embrace only men of singleness of purpose, unselfish, high-minded, zealous in their efforts to wrest from nature the keys to her many mysteries; men who unconsciously, perhaps, in character and conduct, reflect in varying degree the life and spirit of the Great Physician; a profession free from taint of commercialism or graft, in which there shall be no room for the base, the unscrupulous, the ignorant, or unskilled; in which the test for membership has to do only with character and attainment.

"Our hopes and dreams, so long dim, shadowy, and unreal, are about, in part at least, to assume definite and concrete form. We are assembled here this evening to witness, indeed to assist at, the birth of a new agency for good, both to the public and to the profession; to bid Godspeed to this lusty infant, the American College of Surgeons, the offspring of a fruitful union between a deep-rooted and praiseworthy desire within the profession to elevate its standard of ethics and efficiency, and a lively sense of the urgent and long-felt need of its accomplishment.

"The aim of this organization and the reason for its existence lies in its disinterested and unselfish efforts to elevate the standards of the profession, moral as well as intellectual, to foster research, to educate the public up to the idea that there is a difference between the honest, conscientious, well-trained surgeon and the purely commercial operator, the charlatan and the quack; furthermore, that the term "surgeon" means something more than a

suave manner, a glib tongue, a private hospital, a press-agent, and the all too easily acquired diploma, with its accompanying title of 'doctor.' The standardization of surgery is absolutely essential to guard the public against such as these, as well as to preserve the honor of the guild itself. So far as the public is concerned, it is necessary to protect it from the wolves in sheep's clothing, from those who would prostitute their high office for the purpose of gain, from the ignorant and the untrained, from those who by reason of the lack of surgical judgment and skill are incompetent. The American College of Surgeons has been called into being as an active, vigorous, virile protest upon the part of the profession itself against this unhappy state of affairs.

"The public and professional minds should therefore be at once thoroughly disabused of any wrong impression that the College is to be run by any one man or set of men, or by or in association with any pre-existing organization for his or their personal gain or aggrandizement. The American College of Surgeons is no surgical trust, no close corporation for the benefit of the few. It plays no part whatever in medical politics, it does not interest itself in the advancement of any corporation or group of individuals, nor in any special school or cult of medicine. It stands only for the good of humanity and the uplift of professional standards of morality and education."

Adjournment was followed by a reception of the Fellows and guests by the officers of the College and Sir Rickman J. Godlee.

PERMANENT HOME OF THE COLLEGE

At the meeting of the Board of Regents held November 13, 1913, Franklin H. Martin asked the privilege of discussing the selection of a permanent home for the American College of Surgeons. Dr. Martin said: "It is the judgment of your Secretary that the permanent home of the American College of Surgeons should be located in a city other than Chicago. Chicago is already the home of one of the strongest medical organizations in the country, and on the grounds of equity alone, another city should have the honor of housing this new and powerful organization — the American College of Surgeons. I, therefore, move that a committee of five be appointed by the President which should have for its object the selection of a permanent home for the American College of Surgeons. I would include in the motion that this permanent home be ready, if possible, for occupancy at the annual meeting in November, 1914, at the end of our first fiscal year." The motion was seconded by Dr. John B. Murphy.

After considerable discussion, Dr. J. M. T. Finney made a statement in which he said Dr. Martin had presented his views on the subject to him in a personal interview, and that he, Dr. Finney, was convinced in the face of all the facts, that it would be advisable in his opinion to adopt Dr. Martin's resolution. A motion was then passed, all members of the Board of Regents present voting in the affirmative.

The President appointed the following committee on permanent home for the American College of Surgeons: C. F. Stokes, Chairman, F. J. Cotton, H. A. Bruce, G. W. Crile, G. E. Brewer, H. M. Sherman.

FUTURE CONVOCATIONS

The next convocation for the admission of Fellows will be held in one of the eastern cities on Monday evening of the week of the meeting of the American Medical Association. The third convocation and the annual meeting will convene in November, 1914, the date and place to be determined by the Board of Regents.

FELLOWS OF THE AMERICAN COLLEGE OF SURGEONS

The following list contains the names of the surgeons upon whom fellowships in the American College of Surgeons were conferred at the first convocation on November 13, 1913. More than a thousand applications are in the hands of the Committee on Credentials. These will be considered as rapidly as the documents are completed. Other applications for this Charter Member group will be received until November 1, 1914. Successful candidates will receive their fellowships at convocations to be held in June and 1, November, 1914.

HONORARY FELLOWS

Sir Rickman J. Godlee	London, England
William Williams Keen	Philadelphia
William S. Halsted	Baltimore
J. Collins Warren	Boston
Robert F. Weir	New York

UNITED STATES OF AMERICA

ALABAMA

James Norment Baker	Montgomery
Herbert Phalon Cole	Mobile
K. W. Constantine	Birmingham
John D. S. Davis	Birmingham
Francis G. DuBose	Selma
J. N. Furniss	Selma
James A. Goggans	Alexander City
W. T. Henderson	Mobile
L. L. Hill	Montgomery
Robert Somerville Hill	Montgomery
William R. Jackson	Mobile
W. M. Jordan	Birmingham
S. Kirkpatrick	Selma
James Monro Mason	Birmingham
William McDowell Mastin	Mobile
C. A. Thigpen	Montgomery
Isaac Lafayette Watkins	Montgomery

ARIZONA

John Elmer Bacon	Miami
E. Payne Palmer	Phoenix

ARKANSAS

St. Cloud Cooper	Fort Smith
R. C. Dorr	Batesville
William V. Laws	Hot Springs

CALIFORNIA

Frank C. Ainley	Los Angeles
Eliot Alden	Los Angeles
Thomas E. Bailly	San Francisco
J. Henry Barbat	San Francisco
J. Mackenzie Brown	Los Angeles
Rexwald Brown	Santa Barbara
Guy Cochran	Los Angeles
Edward T. Dillon	Los Angeles
William A. Edwards	Los Angeles
H. Bert Ellis	Los Angeles
Ernest W. Fleming	Los Angeles
Oliver D. Hamlin	Oakland
Henry W. Howard	Los Angeles
Thomas W. Huntington	San Francisco
Charles G. Levison	San Francisco
Andrew Stewart Lobingier	Los Angeles
Charles D. Lockwood	Pasadena
Granville MacGowan	Los Angeles
A. L. Macleish	Los Angeles
Frank W. Miller	Los Angeles
E. C. Moore	Los Angeles
M. L. Moore	Los Angeles
Lewis B. Morton	Los Angeles
Henry P. Newman	San Diego
Walter B. Power	Redlands
W. W. Richardson	Los Angeles
Leon Joseph Roth	Los Angeles
Henry Howard Sherk	Pasadena
Harry M. Sherman	San Francisco
Harold D. Sidebotham	Santa Barbara
Rea Smith	Los Angeles
G. B. Somers	San Francisco
Stanley Stillman	San Francisco
F. Dudley Tait	San Francisco
Wallace Irving Terry	San Francisco
I. W. Thorne	San Francisco
C. Van Zwaluwenburg	Riverside
W. Francis B. Wakefield	San Francisco
James Thomas Watkins	San Francisco
Alanson Weeks	San Francisco
William P. Williamson	San Diego
O. O. Witherbee	Los Angeles

COLORADO

Melville Black	Denver
Leonard Freeman	Denver
William W. Grant	Denver
Thomas J. Gallaher	Denver
Edward Jackson	Denver
Walter A. Jayne	Denver
Maurice Kahn	Leadville
Lorenzo B. Lockard	Denver
Oliver Lyons	Denver
Francis H. McNaught	Denver
George B. Packard	Denver
Charles A. Powers	Denver
Horace Greeley Wetherhill	Denver

CONNECTICUT

Arthur N. Alling	New Haven
George M. Burroughs	Danielson
W. H. Carmalt	New Haven
Carl E. Munger	Waterbury
Oliver Cotton Smith	Hartford

DISTRICT OF COLUMBIA

Edward A. Balloch	Washington
Rupert Blue	Washington
William Cline Bordon	Washington
J. Wesley Bovée	Washington
Joseph H. Bryan	Washington
W. P. Carr	Washington
Virginius Dabney	Washington
William G. Erving	Washington
Henry D. Fry	Washington
Francis Randall Hagner	Washington
Joseph Taber Johnson	Washington
Robert S. Lamb	Washington
H. W. Lawson	Washington
L. C. Lehr	Washington
Ernest Pendelton Magruder	Washington
G. Brown Miller	Washington
John F. Moran	Washington
Luther Halsey Reichelderfer	Washington
Charles W. Richardson	Washington
J. J. Richardson	Washington
Stephen O. Richey	Washington
Aurelius Rives Shands	Washington
William F. M. Sowers	Washington
Raymond Spear	Washington
Albert L. Stavely	Washington
Charles Francis Stokes	Washington
Isaac S. Stone	Washington
J. Ford Thompson	Washington
George H. Torney	Washington
George Tully Vaughan	Washington
John R. Wellington	Washington
Charles S. White	Washington
William Holland Wilmer	Washington

FLORIDA

Norman M. Heggie	Jacksonville
Gerry R. Holden	Jacksonville
Carey Pegram Rogers	Jacksonville
Raymond C. Turck	Jacksonville

GEORGIA

William E. Campbell	Atlanta
F. Phinizy Calhoun	Atlanta
William Simpson Elkin	Atlanta
W. S. Goldsmith	Atlanta
Edward Groves Jones	Atlanta
H. H. Martin	Savannah
Floyd Wilcox McRae	Atlanta
Wm. Perrin Nicholson	Atlanta
George Henry Noble	Atlanta

IDAHO

W. H. Carrithers	Moscow
W. F. Howard	Pocatello
C. W. Shaff	Lewiston

ILLINOIS

Frank Allport	Chicago
E. Wyllys Andrews	Chicago
Frank T. Andrews	Chicago
Charles S. Bacon	Chicago
Joseph Barnes Bacon	Macomb
Walter S. Barnes	Chicago
Charles H. Beard	Chicago
Carl Beck	Chicago
Emil G. Beck	Chicago
Joseph C. Beck	Chicago
William T. Belfield	Chicago
Edward M. Bench	Galena
Frederic A. Besley	Chicago
Arthur Dean Bevan	Chicago
Carl E. Black	Jacksonville
Wallace Blanchard	Chicago
George W. Boot	Evanston
Albert I. Bouffleur	Chicago
F. E. Brawley	Chicago
Truman W. Brophy	Chicago
Coleman Graves Buford	Chicago
James Burry	Chicago
Henry T. Byford	Chicago
William E. Casselberry	Chicago
Howard R. Chislett	Chicago
Robert J. Christie	Quincy
William R. Cubbins	Chicago
Carey Culbertson	Chicago
Arthur H. Curtis	Chicago
W. C. Danforth	Evanston
Charles Davison	Chicago
Philip Schuyler Doane	Chicago
Joseph B. DeLee	Chicago

Oscar Dodd	Chicago
Robert Dodds	Chicago
E. J. Doering	Chicago
W. A. Newman Dorland	Chicago
E. C. Dudley	Chicago
Frederick G. Dyas	Chicago
Daniel N. Eisendrath	Chicago
George L. Eyster	Rock Island
George F. Fiske	Chicago
Ira Frank	Chicago
Jacob Frank	Chicago
Lester E. Frankenthal	Chicago
Emanuel Friend	Chicago
William Fuller	Chicago
Thomas L. Gilmer	Chicago
John Ferdinand Golden	Chicago
Albert Goldspohn	Chicago
Mark T. Goldstine	Chicago
David W. Graham	Chicago
George W. Green	Chicago
L. A. Greensfelder	Chicago
Albert E. Halstead	Chicago
Thomas Melville Hardie	Chicago
M. L. Harris	Chicago
William M. Harsha	Chicago
Noble Sproat Heaney	Chicago
William Hessert	Chicago
Junius C. Hoag	Chicago
Rudolph W. Holmes	Chicago
E. Fletcher Ingals	Chicago
Charles E. Kahlke	Chicago
Allen B. Kanavel	Chicago
A. Belcham Keyes	Chicago
George N. Kreider	Springfield
Oscar H. Kraft	Chicago
Sylvan Kunz	Chicago
Dean Lewis	Chicago
William H. G. Logan	Chicago
Frank W. Lynch	Chicago
John Alexander Lyons	Chicago
G. W. Mahoney	Chicago
George Paull Marquis	Chicago
Franklin H. Martin	Chicago
L. L. McArthur	Chicago
George Martin McBean	Chicago
C. Hugh McKenna	Chicago
Frederick Menge	Chicago
Frank D. Moore	Chicago
Frederick B. Moorehead	Chicago
George Morganthau	Chicago
John B. Murphy	Chicago
W. K. Newcomb	Champaign
A. J. Ochsner	Chicago
Edward H. Ochsner	Chicago
John E. Owens	Chicago
Charles E. Paddock	Chicago
William R. Parkes	Evanston
O. L. Pelton, Sr.	Elgin
J. R. Pennington	Chicago
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Nelson M. Percy	Chicago
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Norval H. Pierce	Chicago
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C. F. Sanborn	Chicago
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William E. Schroeder	Chicago
William N. Senn	Chicago
George E. Shambaugh	Chicago
Kellogg Speed	Chicago
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J. Clarence Webster	Chicago
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Daniel H. Williams	Chicago
Casey A. Wood	Chicago
Thomas A. Woodruff	Chicago
Gilbert H. Wynekoop	Chicago

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Edgar Cox	Kokomo
Joseph Rilus Eastman	Indianapolis
Thomas Barker Eastman	Indianapolis
A. M. Hayden	Evansville
Norman E. Jobes	Indianapolis
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Frank A. Morrison	Indianapolis
J. H. Oliver	Indianapolis
Hugo Otto Pantzer	Indianapolis
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Lee Wallace Dean	Iowa City
G. E. Decker	Davenport
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David S. Fairchild, Jr.	Clinton
Oliver J. Fay	Des Moines
J. T. Haller	Davenport
J. C. Hancock	Dubuque
Gordon F. Harkness	Davenport
C. S. James	Centerville
Lawrence W. Littig	Davenport
Donald Macrae, Jr.	Council Bluffs
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H. G Reynolds	Paducah
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Herman B. Gessner	New Orleans
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Ernest S. Lewis	New Orleans
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Rudolph Matas	New Orleans
C. Jeff Miller	New Orleans
Frederick William Parham	New Orleans
W. M. Perkins	New Orleans
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Erastus E. Holt	Portland
Alfred Mitchell, Jr.	Portland

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C. A. Clapp	Baltimore
Sydney M. Cone	Baltimore
Thomas S. Cullen	Baltimore
John Staige Davis	Baltimore
S. Griffith Davis, Jr.	Baltimore
Samuel T. Earle, Jr.	Baltimore
J. M. T. Finney	Baltimore
William A. Fisher, Jr.	Baltimore
Richard H. Follis	Baltimore
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Archibald C. Harrison	Baltimore
John Mason Hundley	Baltimore
Guy LeRoy Hunner	Baltimore
Howard A. Kelly	Baltimore
Frank Martin	Baltimore
Alexius McGlannan	Baltimore
William E. Moseley	Baltimore
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Henry O. Reik	Baltimore
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George Walker	Baltimore
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Randolph Winslow	Baltimore
Thomas C. Worthington	Baltimore
Hugh Hampton Young	Baltimore

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Homer Gage	Worcester
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Charles H. Hare	Boston
Francis B. Harrington	Boston
Walter Clarke Howe	Boston
Joshua C. Hubbard	Boston
F. W. Johnson	Boston
Peer P. Johnson	Beverly
Daniel Fiske Jones	Boston
Frank H. Lahey	Boston
W. B. Lancaster	Boston
George A. Leland	Boston
Robert Williamson Lovett	Boston
Fred B. Lund	Boston
Samuel Jason Mixter	Boston
George Howard Monks	Boston
Franklin Spilman Newell	Boston
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R. F. O'Neil	Boston
Robert B. Osgood	Boston
Horace Packard	Boston
Charles Allen Porter	Boston
Edward Reynolds	Boston
George L. Richards	Fall River
E. P. Richardson	Boston
Jane D. Kelly Sabine	Boston
Charles Locke Scudder	Boston
Ralph Holland Seelye	Springfield
Channing C. Simmons	Boston
Mary Almira Smith	Boston
Robert Soutter	Boston
Myles Standish	Boston
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Augustus Thorndike	Boston
Philemon E. Truesdale	Fall River
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Richard G. Wadsworth	Boston
Hugh Williams	Boston

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Max Ballin	Detroit
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Clark D. Brooks	Detroit
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J. Henry Carstens	Detroit
Ray Connor	Detroit
Ernest K. Cullen	Detroit
Marshall L. Cushman	Lansing
C. C. Darling	Ann Arbor
C. B. G. de Nancrède	Ann Arbor
William T. Dodge	Big Rapids
Robert W. Gillman	Detroit
Herbert W. Hewitt	Detroit
Louis J. Hirschman	Detroit
R. J. Hutchinson	Grand Rapids
Frederick C. Kidner	Detroit
Daniel LaFerté	Detroit
Albert L. Lawbaugh	Calumet
Howard W. Longyear	Detroit
Walter P. Manton	Detroit
Joshua G. R. Manwaring	Flint
Theodore A. McGraw	Detroit
Wm. Francis Metcalf	Detroit
William H Morley	Detroit
Walter Robert Parker	Detroit
Rolland Parmeter	Detroit
Reuben Peterson	Ann Arbor
Frederick W. Robbins	Detroit
C. H. Sample	Saginaw
B. R. Schenck	Detroit
Burt R. Shurly	Detroit
Richard R. Smith	Grand Rapids
Harry N. Torrey	Detroit
Frank B. Walker	Detroit
F. C. Warnshuis	Grand Rapids

D. Emmet Welch . . . . . Grand Rapids
Frank C. Witter . . . . . Petoskey

MINNESOTA

A. W. Abbott . . . . . Minneapolis
E. H. Beckman . . . . . Rochester
Alexander R. Colvin . . . . St. Paul
Walter Courtney . . . . . Brainard
W. A. Dennis . . . . . St. Paul
Robert Earl . . . . . St. Paul
Emil S. Geist . . . . . Minneapolis
Arthur J. Gillette . . . . . St. Paul
John H. James . . . . . Mankato
E. S. Judd . . . . . Rochester
Hannibal H. Kimball . . . . Minneapolis
Arthur Ayer Law . . . . . Minneapolis
J. Warren Little . . . . . Minneapolis
Jennings C. Litzenberg . . . . Minneapolis
Archibald MacLaren . . . . St. Paul
William H. Magie . . . . . Duluth
Arthur T. Mann . . . . . Minneapolis
Charles H. Mayo . . . . . Rochester
William J. Mayo . . . . . Rochester
James E. Moore . . . . . Minneapolis
Horace Newhart . . . . . Minneapolis
John H. Rishmiller . . . . . Minneapolis
Harry P. Ritchie . . . . . St. Paul
William E. Rochford . . . . Minneapolis
John T. Rogers . . . . . St. Paul
John L. Rothrock . . . . . St. Paul
Arnold Schwyzer . . . . . St. Paul
Gustav Schwyzer . . . . . Minneapolis
Charles N. Spratt . . . . . Minneapolis
Eugene S. Strout . . . . . Minneapolis
H. B. Sweetser . . . . . Minneapolis
Frank C. Todd . . . . . Minneapolis
Franklin R. Wright . . . . Minneapolis

MISSISSIPPI

Hugh A. Gamble . . . . . Greenville
B. B. Martin . . . . . Vicksburg
Harley R. Shands . . . . . Jackson

MISSOURI

Nathaniel Allison . . . . . St. Louis
F. W. Bailey . . . . . St. Louis
Willard Bartlett . . . . . St. Louis
J. F. Binnie . . . . . Kansas City
Vilray P. Blair . . . . . St. Louis
John Young Brown . . . . . St. Louis
George W. Cale, Jr. . . . . St. Louis
N. B. Carson . . . . . St. Louis
J. W. Charles . . . . . St. Louis
Malvern B. Clopton . . . . St. Louis
W. T. Coughlin . . . . . St. Louis
Harry Sturgeon Crossen . . . St. Louis
Walter B. Dorsett . . . . . St. Louis
Oscar H. Elbrecht . . . . . St. Louis
W. J. Frick . . . . . Kansas City
Eugene C. Gehrung . . . . . St. Louis
Jacob Geiger . . . . . St. Joseph
George Gelhorn . . . . . St. Louis
Frank A. Glasgow . . . . . St. Louis
J. D. Griffith . . . . . Kansas City
J. G. Hayden . . . . . Kansas City
A. E. Hertzler . . . . . Kansas City
Howard Hill . . . . . Kansas City
Roland Hill . . . . . St. Louis
Jabez N. Jackson . . . . . Kansas City
Ernst Jonas . . . . . St. Louis
Walter C. G. Kirchner . . . . St. Louis
Bransford Lewis . . . . . St. Louis
Hanau W. Loeb . . . . . St. Louis
James E. Logan . . . . . Kansas City
Frank J. Lutz . . . . . St. Louis
F. M. McCallum . . . . . Kansas City
Harvey G. Mudd . . . . . St. Louis
Fred T. Murphy . . . . . St. Louis
Clarence M. Nicholson . . . St. Louis
Frank G. Nifong . . . . . Columbia
Archer O'Reilly . . . . . St. Louis
John M. Perkins . . . . . Kansas City
Francis Reder . . . . . St. Louis
Ernest F. Robinson . . . . Kansas City
W. E. Sauer . . . . . St. Louis
M. G. Seelig . . . . . St. Louis
William A. Shoemaker . . . . St. Louis
Selden Spencer . . . . . St. Louis
Jackson B. Taulbee . . . . . Joplin
Frederick J. Taussig . . . . St. Louis
John H. Thompson . . . . Kansas City
Herman Tuholske . . . . . St. Louis
Paul Y. Tupper . . . . . St. Louis

MONTANA

T. Casey Witherspoon . . . . Butte

NEBRASKA

Simon C. Beede . . . . . David City
C. DeWitt Bryant . . . . . Omaha
B. B. Davis . . . . . Omaha
Palmer Findley . . . . . Omaha
Harold Gifford . . . . . Omaha
August F. Jonas . . . . . Omaha
John Prentiss Lord . . . . . Omaha
Albert R. Mitchell . . . . . Lincoln
H. Winnett Orr . . . . . Lincoln
Harold P. Salter . . . . . Norfolk
John E. Summers . . . . . Omaha

NEW JERSEY

Robert Morrison Curts	Paterson
W. E. Darnall	Atlantic City
Gordon K. Dickinson	Jersey City
Linn Emerson	Orange
Charles L. Ill	Newark
Edward Joseph Ill	Newark
Walter B. Johnson	Paterson
John C. McCoy	Paterson

NEW YORK

Robert Abbe	New York
Fred Houdlett Albee	New York
L. Grant Baldwin	Brooklyn
Gorham Bacon	New York
Samuel Wyllys Bandler	New York
L. Bolton Bangs	New York
Arthur J. Bedell	Albany
A. G. Bennett	Buffalo
T. Passmore Berens	New York
W. H. Bishop	New York
Dougal Bissell	New York
Joseph A. Blake	New York
J. A. Bodine	New York
Arthur H. Bogart	Brooklyn
John Bion Bogart	Brooklyn
Hermann J. Boldt	New York
George Emerson Brewer	New York
Wm. Barrett Brinsmade	Brooklyn
LeRoy Broun	New York
Joseph D. Bryant	New York
W. Sohier Bryant	New York
Henry G. Bugbee	New York
Peter A. Callan	New York
Wm. Francis Campbell	Brooklyn
Alexis L. B. Carrel	New York
Walter F. Chappell	New York
C. H. Chetwood	New York
J. Bayard Clark	New York
Clement Cleveland	New York
Marshall Clinton	Buffalo
Gerhard H. Cocks	New York
H. C. Coe	New York
William B. Coley	New York
George F. Cott	Buffalo
E. B. Cragin	New York
H. Holbrook Curtis	New York
William Darrach	New York
Asa Barnes Davis	New York
Henry Beeckman Delatour	Brooklyn
Edward B. Dench	New York
Robert L. Dickinson	Brooklyn
C. N. Dowd	New York
Arthur B. Duel	New York
Warren L. Duffield	Brooklyn
J. Clifton Edgar	New York
Charles A. Elsberg	New York
John F. Erdmann	New York
Mathias Figueira	Brooklyn
Edwin Howe Fiske	Brooklyn
Ralph R. Fitch	Rochester
Austin Flint, Jr.	New York
M. L. Foster	New Rochelle
Russell Story Fowler	Brooklyn
Lee Masten Francis	Buffalo
Thomas R. French	Brooklyn
Eugene Fuller	New York
Henry Dawson Furniss	New York
James A. Gardner	Buffalo
Arpad G. Gerster	New York
Charles L. Gibson	New York
J. Riddle Goffe	New York
Charles H. Goodrich	Brooklyn
Onslow Allen Gordon	Brooklyn
Hermann Grad	New York
Robert H. Greene	New York
Ramon Guiteras	New York
Thomas H. Halsted	Syracuse
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BOOK REVIEWS

FIBROIDS OF THE UTERUS: THEIR PATHOLOGY AND TREATMENT. By Sir John Bland-Sutton, F. R. C. S. London: Science Reviews, Ltd.

In this small volume the distinguished author treats his subject according to the conventional classification and the clinical phase is emphasized throughout. The relation of fibroids to pregnancy, labor, and the puerperium, to uterine carcinoma and to the bladder and ureters are given particular attention in special chapters. Multiparity as an etiologic factor in fibrosis uteri is ignored, this pathologic condition being regarded rather as an end product of septic infection, and at that of the long standing Neisserian type. Adenomyoma is regarded as the product of epithelial overgrowth with a responsive increase of the connective tissue in which the glands are implanted, this being attributed, again, to the action of micro-organisms. Pulmonary embolism after abdominal hysterectomy and the relation of thrombosis and embolism to septic infection of the uterus is considered at length. Argument in favor of supravaginal hysterectomy as opposed to total extirpation is ably set forth in the final chapter. This operation is regarded as unrivaled among surgical procedures for its ability to amend invalid women by thousands, enabling them to lead useful lives as well as to be companions to their husbands and mothers to their children.

The illustrations are plentiful, for the most part picturing gross pathology. Instead of an elaborate and complete bibliography, the author has appended to the various chapters lists of references, many of which serve as milestones indicating the progress in pelvic surgery. CAREY CULBERTSON.

THE NARCOTIC DRUG DISEASES AND ALLIED AILMENTS. By Geo. E. Pettey, M. D. Philadelphia: F. A. Davis Company, 1913.

This book is a presentation of the subject of narcotic drug diseases based upon the author's wide experience. Throughout the book emphasis is placed upon the conception of drug addiction as being in effect a disease and should be treated as such. It is a meritorious monograph in which the conceptions of the author are recorded in detail. It is of special value in so far as the outlined treatment is concerned, the author having made plain, and apparently very simple, each step in the management of these refractory cases.

Included in the details of treatment are favorite prescriptions, and a discussion of the effects to be derived from the use of such drugs as scopolamine, hyoscine, strychnine, and certain cathartics. It is well written, adequately illuminated by case reports, and is for the most part convincing.

The book contains a discussion of physical training and dietetics as employed in the treatment of the drug diseases, and also several chapters devoted to a discussion of the "literature" upon this subject, consisting in excerpts from the writings of other authors, followed by "author's comments," in which these writings are criticized.

CHARLES A. ELLIOTT.

VACCINE AND SERUM THERAPY. By Edwin Henry Schorer, B.S., M.D. St. Louis: C. V. Mosby Company, 1913.

Primarily a review of authorities on this very important subject, with a view to bringing more recent discoveries down to date and presenting in a concise manner the later theoretical and laboratory specific diagnosis of serum therapy.

The author has been patient and painstaking in giving details as to the laboratory technique in specific diagnosis, therapy and treatment. While parts of the work are extremely theoretical and of interest only to specialists in this line, the general scope makes up a manual that is of much value to the general practitioner, as well as the specialist, in every form of medicine and surgery. Considerable space is devoted to a discussion of the opsonic index and the importance of opsonin in health and disease. The author has successfully established theoretical and experimental evidence as well as clinical application of the specific treatment of bacterial disease. To accomplish this some space has been given to infections in general and the theories of immunity with special emphasis to the opsonic theory of immunity.

THE MODERN TREATMENT OF NERVOUS AND MENTAL DISEASES. By American and British authors. Edited by William A. White, M.D., and Smith Ely Jelliffe, A.M., M.D., Ph.D. Philadelphia and New York: Lea & Febiger.

Volume I of this work is made up of nineteen chapters by as many foremost authors and is a consistent and comprehensive outline of a rational therapeutics of diseases of the nervous system and the mind. In order to better serve its purpose the editors have arranged the subject matter so that diseases related etiologically are discussed together and in such a way as to appeal not only to the physician but to the educator, the legislator, the judge and lawyer, the student of criminology, immigration, and of dangerous trades; in fact, for all who are interested in nervous and mental hygiene.

The parts devoted to syphilis of the nervous system are comprehensive and while the therapeutic requirements are held uppermost, the various clinical entities are differentiated yet brought together and discussed and appropriate treatment outlined.

Chapter I deals with eugenics in nervous and mental diseases. Chapter III with sexual problems, their nervous and mental relations.

Chapter IV with the educational treatment of the feeble-minded.

Chapter VIII with the treatment of the neuroses, including the psychoneuroses.

Chapter XVI with presenile arteriosclerotic and senile disorders of the brain and cord.

The work is decidedly one of preventive medicine and differs widely from the ordinary textbook in that it is planned on a broad scale and emphasizes the fact that the psychical side of life merits quite as much consideration as the physical, offering reconstructive factors in social organization and applying them to human ills. The book is clearly written, comprehensible alike to physician and layman whose education has been sufficient to stimulate an interest in human welfare. H. A. POTTS.

PREVENTIVE MEDICINE AND HYGIENE. By Milton J. Rosenau, M. D. New York: D. Appleton & Co., 1913.

This work is in effect a textbook upon the subject of preventive medicine. It is an excellent and concise presentation of the subject, and is a textbook that is certain to take a prominent place among the standard textbooks of medicine. The facts brought together in this volume are derived from diverse and widely scattered sources, from the broad fields of many related sciences, and being readable and compactly put together in logical sequence, form a valuable work for both the student and sanitary officer.

Using an excellent textbook style, the author has illuminated the subjects discussed with sufficient concrete examples, illustrating the points discussed, and by so doing has not cumbered the book with much of the dead wood so often found in monographs treating upon these same subjects.

The book deals with broadly diversified, yet properly related subjects, including a detailed discussion of the infectious diseases, insect born diseases, quarantine, immunity, heredity, eugenics, epilepsy, food, ventilation, public water supply, ice, sewage disposal, vital statistics, occupational diseases, disinfection, and many other related subjects, treating them always from the preventive medical viewpoint and properly linking them together so as to give an adequate idea of this broad subject.

The chapter upon immunity is particularly instructive, including a discussion of the mechanism of immunity, bacillus carriers, latency, Ehrlich's side chain theory, the nature of toxines, antitoxines, phagocytosis, anaphylaxis, etc., all being presented in textbook manner, the main facts being given with didactic precision.

The section devoted to foods is comprehensive, although necessarily compact, to fit the scope of the book. A general treatment of the whole subject is presented, including a classification of foods, a discussion of adulteration of foods, decomposition, preservation and preparation of foods. The chapter upon milk is short yet adequate, and includes a discussion of milk supply, classification, adulteration, diseases spread by milk, and the methods for the examination of milk. The chapter upon meat covers a discussion of such subjects as the production, preservation and inspection of meat. The various diseases produced by the consumption of infected and spoiled meat is thoroughly and satisfactorily dealt with. The subjects of eggs and vegetable supply are dealt with in the same way.

The sections devoted to air, water, sewage and refuse disposal are fitting for the scope of this work. Ventilation, heating and the effects of vitiated air are discussed as well as water supply, the analysis of water, the methods of purifying water, and water and its relation to disease.

These are all subjects which should be taken up in the class room, and to the mind of the reviewer no more compact, yet logical and comprehensive textbook, fulfilling the requirements of the class room, has been written. The eminence of the author, the logical classification of subjects, and the authoritative manner of presentation, stamp this book as a textbook of the first order, to be considered along with Osler, Adami, and others of the undying textbooks that stay throughout the years.

CHARLES A. ELLIOTT.

GENITO-URINARY DIAGNOSIS AND THERAPY. By Ernst Portner, M. D. A Translation from the German by Bransford Lewis. St. Louis: C. V. Mosby Co.

The title is misleading, as the book is intended only to present therapeutic measures in genito-urinary diseases. Very rarely indeed is any reference made to diagnosis, such reference being made to emphasize certain important points. In its translation the book has been so freely edited by Lewis that it assumes the aspect of co-authorship. The manual is full of brilliant, concise instructions in the matter of preventative, palliative and radical therapeutics. No space is wasted in a review of the authorities or the exploitation of theoretical hobbies so common in the medical literature of the present day. Brevity has enabled the author to comprehensively treat, in a matter of 200 pages, the therapy of the entire field of genito-urinary diseases and has left him space to review in separate chapters those genito-urinary diseases of women and children which present special peculiarities. The book is well suited to the needs of the student, general practitioner and specialist because of the intensity, clarity and brevity of the text.